

# Phytoremediation of lead in contaminated urban residential soils of Portland, Maine, U.S.A

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## Abstract:

Lead contamination in urban residential soils is a widespread problem, and lead poisoning is an important environmental health problem affecting children world-wide. Many soils in the greater Portland, Maine, U.S.A. area are contaminated with high concentrations of lead, largely because of the prevalence of lead in pre-1978 residential paint and past industrial activities. Plants grown in lead contaminated soil may accumulate lead from translocation into plant tissues, and this phytoremediation process may be exploited for soil remediation. The purpose of this research was to test the ability of phytoextraction to reduce soil lead concentrations using *Spinacia oleracea* (spinach) grown in thirteen urban residential gardens contaminated with lead. The spinach was planted in May and harvested in July. Soil samples were collected from the garden areas before planting and after harvesting, and analyzed for total and plant available lead, pH, organic carbon, and particle size. Plant roots and shoots were analyzed for total lead. Spinach accumulated greater than 340 ug Pb/g dry weight in roots, and 105 ug Pb/g dry weight in shoots, and decreased total soil lead concentrations by 11%, and plant available lead concentrations by 21%. Strong correlations were found between total and plant available lead and between total and plant available lead and lead concentrations in shoots and roots. Correlations were also found between total and plant available lead and pH. The high metal accumulation suggests that spinach may be used to clean up toxic metal contaminated sites. This method of phytoextraction should be researched further and tested on sites for more than one crop rotation in order to examine the long term possibilities of using phytoremediation to reduce heavy metal contamination and improve the quality of the soil.

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