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Accumulation of Potentially Harmful Elements in Vegetables from Two Geological Settings in Zimbabwe

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Abstract

In this paper, we determine the effect of elevated concentrations of potentially harmful element (PHE) accumulation in nine common, locally grown, vegetables on two different kinds of geological substrate. The study was carried out in the Sanyati catchment area, where the prevalence of some obscure diseases has been reported. A comparison is made between accumulation factors of PHEs in vegetables grown in soils from a Greenstone belt, and the same vegetables grown in soils from a granite pegmatite terrane. Vegetables from mineralised areas of the Greenstone belt were found to contain much higher concentrations of Pb and Ag than vegetables from Hurungwe, in the granite pegmatite zone. The average Pb and Ag was found to be 6 ppm and 185ppb in the granite pegmatite terrane against an average of 43ppm and 4644 ppb in the greenstone belt respectively. Tomatoes and pumpkin leaves were found to have the highest potential for PHE accumulation, regardless of the type of substrate on which they grow; and Ag was the most highly accumulated PHE. We extrapolated these datasets, and subjected them to statistical analyses to determine possible links between PHE excesses and disease incidence in mining impacted areas in Zimbabwe. Finally, we demonstrate the application of these results in risk analysis and monitoring of PHE uptake by food crops into the food chain, to aid development of environmental clean-up policies.

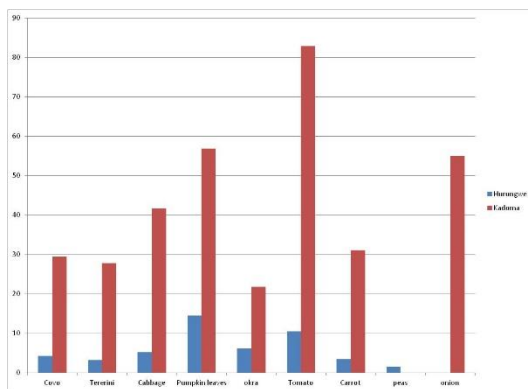


Figure 1 Comparison of Lead (Pb) in ppm in a granitic terrane (blue), compared to a greenstone belt (red)

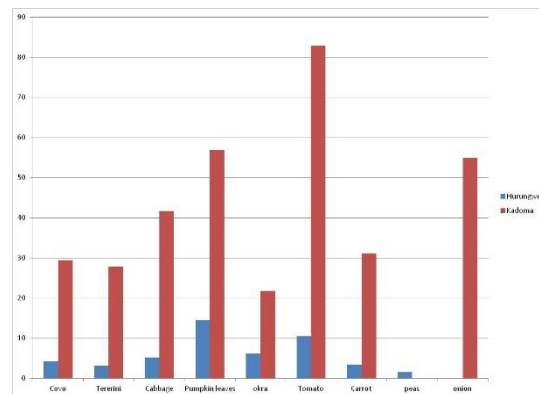


Figure 2 Comparison of Silver (Ag) in ppb in a granitic terrane (blue), compared to a greenstone belt (red)

Keywords: Mining, potentially harmful elements, vegetables, disease incidence, Sanyati

