

Transfer of potential harmful elements from soils to foodstuff used in human and animal diet in the surroundings of the Estarreja Chemical Complex: a preliminary study

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This study was performed to assess the concentrations of trace elements in soils and its transfer to vegetables grown around the Estarreja Chemical Complex, in order to evaluate their potential effects on human and animal health as they are used for consumption. In Estarreja soils, vegetation and groundwater contamination are chiefly related to past industrial activities. Previous studies [1] reported the highest soil concentrations of potential harmful elements (PHEs) as As ($>10,000 \text{ mg kg}^{-1}$) and Hg ($> 100 \text{ mg kg}^{-1}$) near the factories and sewage outlets. According to health guideline values serious public health problems could arise because these sandy and permeable soils are often used as pasture and agricultural land. On the other hand, there are no studies in the area that investigate PHEs transfer in the soil-plant-man/animal system and its implications to health problems. Composite samples of 26 agricultural soils (soil top layer) were collected in an area of approximately 25 km² surrounding the village of Estarreja and the industrial complex. The plants in a total of 26 cabbage (*Brassica oleracea* L.), 25 tomato (*Lycopersicon esculentum*), 4 lettuce (*Lactuca sativa* L.) and 12 maize ears (*Zea mays* L.) samples were collected according to its availability at kitchen gardens and small farms. Soil samples were air-dried, sieved at $< 2 \text{ mm}$ and analysed for physicochemical parameters as pH

and organic matter, following classic methods. Plants were carefully washed and dried at 40° C. All samples were fresh and dry weight measured and grinded for analysis. Multi-element analysis in both soils and plants were performed by ICP/ES-MS in ACME certified laboratory, after extraction with aqua regia ("near total" concentration) and also after soil leaching with ammonium acetate ("bioavailable" content). Biological absorption coefficient and correlations between the PHEs concentration in soils ("near total" and bioavailability) and those found in plants (edible parts) were investigated in order to characterize plants bioconcentration. The foodstuff potential to present adverse effects for man and animals throughout ingestion is also discussed. In a near future these data together with groundwater should be used to investigate possible relationships to public health problems.

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References

[1] Inácio, M., Ferreira E., Pereira V. 2010. Proceedings of 15th International Conference on Heavy Metals in the Environment, Poland. 856-859.

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