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Interactive comment on "Phytoextraction and the economic perspective of phytomining of heavy metals" *by* Amjad Ali et al.

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This is a very scientifically wrong paper. Yes, it cites a lot of papers which appear to support the views of the authors. But they are dead wrong. I have estimated the cost of EDTA-induced chelation (which is not permitted in the US or EU because it causes leaching to metals to ground water). It costs on the order of $20,000/ha-year.

And the discussion of hyperaccumulators is nearly totally about tests with single metal salt amended soils. Many about Cd. But nearly all Cd contamination in the real world has 100 times more Zn as from Zn ores and smelter fumes contaminating soils. Although some of the listed plant species can exceed 100 ppm Cd in shoots when grown on salt Cd amended soils, they all die with no more than 500 ppm Zn, which limits Cd

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to about 5 ppm. They are of absolutely no use in Cd phytoextraction.

In the case of As, the chemical state and concentration matters much in how high concentration As reaches in the ferns shown to accumulate As. In soils with low levels of As, where phytoextraction might be cost effective and done in a few years, plants remove very little per year because the bioaccumulation factor is limited by soil availability.

Nearly all of the papers which support their discussion of phytoextraction are irrelevant to the real world of phytoextraction!

A recent review paper which covers the important errors regarding chelator-induced phytoextraction is attached (Chaney et al., 2010). In it the detailed calculation of the cost of adding EDTA for chelator-induced Pb phytoextraction are presented. Actually, the other chelating agents (e.g., citrate, EDDS, etc.) are more expensive than EDTA.

That text says: "Another proposed phytotechnology is ‘induced phytoextraction,’ in which chelating agents are applied to soils to dissolve soil metals and aid their uptake by plants (e.g., Blaylock et al., 1997). As discussed previously by Chaney et al. (2010), addition of chelating agents to promote plant uptake of soil metals is neither cost effective nor environmentally acceptable. Nowack et al. (2006) provides a thorough review of the environmental risks of using chelating agents to induce phytoextraction: ultimately, more metals are leached than are absorbed by plants. We obtained information to make a new estimate of the cost of applying EDTA for induced phytoextraction. We assume 10 mmol Na2EDTA kg-1 soil and that the EDTA is purchased in truckload (20 t) quantities. The price of technical grade Na2EDTAâĂć2H2O (FW 372 g mol-1) (US$3.16 kg-1 in 2014) was obtained from a major international manufacturer. Assuming 15 cm depth of soil Pb contamination with 2âĂć106 kg soil ha-1, one application of Na2EDTA at 10 mmol kg-1 soil costs US$23,500 ha-1. Induced phytoextraction with EDTA was never a good idea and has not been permitted for over 10 years in the US or the EU."

From: Chaney, R.L., R.D. Reeves, I.A. Baklanov, T. Centofanti, C.L. Broadhurst, A.J.M. Baker, J.S. Angle, A. van der Ent and R.J. Roseberg. 2014. Phytoremediation and phytomining: using plants to remediate contaminated or mineralized environments. Chapter 15, pp. 365-391. In R. Rajakaruna, R.S. Boyd and T. Harris (Eds). Plant Ecology and Evolution in Harsh Environments. Nova Science Publishers, NY.

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Please also note the supplement to this comment:
https://www.solid-earth-discuss.net/se-2017-75/se-2017-75-RC2-supplement.pdf

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