Does type of parent ultrabasite affect the bioaccessibility of metals in serpentine soils?

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Weathering of ultrabasic rocks (peridotites and serpentinites), naturally enriched in metallic elements (e.g., Ni, Cr and Co) leads to formation of infertile serpentine soils. The main difference between igneous peridotite and metamorphic serpentinite refers to the mineralogy of these rocks while their chemical composition is very similar. Generally, major components of peridotites (olivine, pyroxene) are less resistant to weathering than serpentine group minerals - principal components of serpentinites. It is therefore expected that the mobility of metallic elements is higher in soils derived from peridotites as compared with soils developed on serpentinites.

For this study we have analyzed six pedons developed on several types of ultrabasic rocks: (i) proper serpentinites, (ii) serpentinite with aggregates of olivine and pyroxene (iii) partially serpentinised peridotite and (iv) hornblende peridotite. Studied ultrabasites have similar chemical composition and contain comparable concentrations of Ni (up to 2370 ppm), Cr (up to 3430 ppm) and Co (up to 120 ppm). The bioaccessibility of Ni, Cr and Co, determined using the EDTA extraction, is the highest for Ni whereas Cr is the least mobile element in all studied soils. The lowest proportions of EDTA extractable fraction of Ni and Co (up to 7 and 4 % of total concentrations respectively) are observed in soils derived from proper serpentinites devoid of primary minerals (e.g., olivine, pyroxene) and having non-pseudomorphic texture. The highest proportions of Ni and Co-EDTA extractable are noted in soils derived from partially serpentinised peridotite, hornblende peridotite and serpentinite having typical pseudomorphic texture, containing primary Al-rich magnesiochromite (up to 18 and 16 % of total concentration respectively). Thus, it seems to be justified that type and origin of ultrabasic parent rock affect metal mobility in studied soils.

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