



Accumulation of Mn and Fe in aromatic plant species from Rosalgar mine and their potential human risk

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The ecophysiological behaviour (translocation and accumulation) of Fe and Mn in three aromatic species growing spontaneously in soils from old mine of Rosalgar (Setúbal district, South of Portugal) were analysed in order to assess their potential impact on human health. Three different Lamiaceae species (*Oreganum vulgare* subsp. *virens*, *Calamintha nepeta* subsp. *glandulosa* and *Lavandula stoechas* subsp. *luisieri*) were sampled and their chemical composition (roots and shoots) was determined. Soils surrounding the rhizosphere system were also characterized. Soils had a pH close to neutral, with a range between 5.8-6.1 and small fertility. The mean total content of Mn and Fe in soils was 13605 mg/kg and 81870 mg/kg, respectively. These values are higher than the average concentrations in non-contaminated soils of the region (737 mg Mn/kg and 36833 mg Fe/kg). The Mn concentration in the available fraction of the soils (extracted with Rhizo method, which simulates the rhizosphere conditions) was also very high (467–1000 mg/kg). The range of Fe concentration in the soils available fraction was 69–124 mg/kg. The available fraction of Mn was correlated with pH ($r=0.73$) and the total concentration of Mn ($r=0.91$). Although the soils had high total and available concentrations of Mn and Fe, the plant cover is significant and soils are naturally colonized by vegetation. Studied species showed different translocation and accumulation patterns being the lavender the only species that translocated Mn from roots to shoots reaching a mean value of 890 mg/kg .that was much higher than the values observed in the other two species and higher than normal range for plants (10–600 mg Mn/kg). *Oreganum* and *Calamintha* showed concentrations of Fe in the shoots (mean values of 240 and 176 mg/kg, respectively) lower than in lavender (mean value of 535 mg Fe/kg). This study shows that besides mining activities ceased many years ago soils are still contaminated by Mn and Fe. However, the concentration of Mn in *Oreganum* and *Calamintha* (both species used for culinary purposes by the inhabitants of the region) was lower than provisional tolerable daily intake values indicating that its consumption is safe for alimentary use.

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