EGU22-8337
https://doi.org/10.5194/egusphere-egu22-8337
EGU General Assembly 2022

Changes in the solubility and potential toxicity of metal(loid)s in soils treated with Technosols

Antonio Aguilar-Garrido, Ana Romero-Freire, Mario Paniagua-López, Francisco Javier Martínez Garzón, and Francisco José Martín-Peinado
Universidad de Granada, Facultad de Ciencias, Edafología y Química Agrícola, Granada, Spain (antonioag@ugr.es)

The influence of six different Technosols on solubility and potential toxicity of metal(loid)s from polluted soils was studied. Technosols were made with a soil affected by residual pollution coming from the Guadiamar Green Corridor and different combinations of three organic wastes [solid olive-mill (T1 and T4), sewage sludge (T2 and T5), and gardening vermicompost (T3 and T6)]. In addition, carbonate-rich material from a peatbog was applied to T1, T2, and T3; while marble sludge was added to T4, T5, and T6; iron-rich sludge (2%) was also applied to all Technosols. The comparison with a non-polluted soil from the study area is also included. Main soil properties (pH, EC, and OC) and solubility of potentially harmful elements (PHEs) in a soil:water extract (1:10) was measured both in Technosols as in soils after two months of incubation period. Potential toxicity was estimated by a germination bioassay with *Trifolium pratense* L.

The different Technosols showed changes in the solubility of PHEs with significant differences between elements. Cu and Zn strongly reduced the solubility in T3 and T6 in relation to the polluted soil; Cd was reduced in all cases without significant differences between Technosols; and Pb increased in Technosols treated with solid olive-mill (T1 and T4) and sewage sludge (T2 and T5). A significant increase in the solubility of As and Sb was detected in all cases. Likewise, soil treated with Technosols showed differences in solubility of PHEs. Cu and Zn were strongly reduced in the soil treated with T6, and Cd and Pb was reduced in all cases. Arsenic was reduced in all treated soils, although the soluble concentration remained slightly above the values of non-polluted soil. While Sb solubility increased in soils treated with Technosols made with carbonate-rich material from a peatbog (T1, T2, and T3), and maintained at the same level as in polluted soils for soils treated with Technosols made with marble sludge (T4, T5, and T6). These behaviours are mainly related to the increase in calcium carbonate content and the rise in pH in Technosols compared to the polluted soil. The germination bioassay with *T. pratense* showed very high toxicity (no germination) in soils treated with sewage sludge (T2 and T5), high toxicity (>75% reduction in germination in relation to non-polluted soil) in soils treated with solid olive-mill (T1 and T4), and low toxicity (15% reduction in germination in relation to non-polluted soil) in soils treated with gardening vermicompost (T3 and T6).

Our results indicate that the Technosol composed of gardening vermicompost were the most effective in the reduction of PHEs solubility and toxicity; however, additional studies should be

made to assess the increase of mobility in As and Sb after Technosol treatment.