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Monitoring of the effect of biological activity on the pedogenesis of a constructed Technosol

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Pedogenesis is the set of steps, which lead to the formation and evolution of soils under pedogenetic factors and processes. They may be described quantitatively for a modeling end. For this purpose, constructed Technosols are candidates to be studied, because their initial composition is well described. Furthermore, among pedogenetic factors, living organisms are known to play a major role in soil formation. The most challenging objective of our work is then to monitor in situ the effect of biological agents on soil evolution. However, soil pedogenesis is known to be dynamic, therefore visualizing in situ plant roots or soil fauna in contact with soil, will help understand better how pedogenesis occurs realistically. The aim of this work is to study in situ, visually and quantitatively, the evolution of a constructed Technosol pedogenesis using an innovative dispositive of observation on cosmes. The Technosol is constructed in three horizons, from bottom to top we have: gravels, treated industrial soil and paper mill sludge (2/3, 1/3 masse ratio) and green waste compost. The soil is put into a cosme equipped with image acquisition devices. Factors are organized into two modalities each repeated three times. “Plant”, where five seeds of white lupin are sown in each cosme. “Plant and Fauna” where six epigeic adult earthworms and five seeds of white lupin are inoculated, and a “control”. A moisture of 60 – 80 % field capacity is maintained in all modalities. Results show that roots grow at 10 mm.day-1 speed during the first three weeks. Roots increase porosity and aggregation with time. Earthworms explore the soil randomly by creating and filling burrows. At a second time, they create their burrows preferentially along plant roots. Roots and earthworms contribute to the rapid increase of porosity (9.81 times control at 268 days) and aggregation (10.15 times control at 268 days) during time, in the early stages of pedogenesis. In situ and non-destructive observation of soil profiles is therefore an innovative way of monitoring and quantifying the impact of pedogenetic factors on the evolution of Technosols.