Geophysical Research Abstracts
Vol. 12, EGU2010-2856, 2010
EGU General Assembly 2010

The influence of compost addition on the water repellency of brownfield soils

Amii Whelan, Cedric Kechavarzi, Ruben Sakrabani, Frederic Coulon, Robert Simmons, and Guozhong Wu
Natural Resources Department, School of Applied Sciences, Cranfield University, MK43OAL, Cranfield, UK
(a.whelan@cranfield.ac.uk)

Compost application to brownfield sites, which can facilitate the stabilisation and remediation of contaminants whilst providing adequate conditions for plant growth, is seen as an opportunity to divert biodegradable wastes from landfill and put degraded land back into productive use. However, although compost application is thought to improve soil hydraulic functioning, there is a lack of information on the impact of large amounts of compost on soil water repellency. Water repellency in soils is attributed to the accumulation of hydrophobic organic compounds released as root exudates, fungal and microbial by-products and decomposition of organic matter. It has also been shown that brownfield soils contaminated with petroleum-derived organic contaminants can exhibit strong water repellency, preventing the rapid infiltration of water and leading potentially to surface run off and erosion of contaminated soil. However, hydrophobic organic contaminants are known to become sequestrated by partitioning into organic matter or diffusing into nano- and micropores, making them less available over time (ageing). The effect of large amounts of organic matter addition through compost application on the water repellency of soils contaminated with petroleum-derived organic contaminants requires further investigation.

We characterised the influence of compost addition on water repellency in the laboratory by measuring the Water Drop Penetration Time (WDPT), sorptivity and water repellency index through infiltration experiments on soil samples amended with two composts made with contrasting feedstocks (green waste and predominantly meat waste). The treatments consisted of a sandy loam, a clay loam and a sandy loam contaminated with diesel fuel and aged for 3 years, which were amended with the two composts at a rate equivalent to 750t/ha. In addition core samples collected from a brownfield site, amended with compost at three different rates (250, 500 and 750t/ha) in 2007, were also tested.

The results show that the water repellency of air dried samples is significantly higher in samples amended with composts and increases with increasing organic matter content. The WDPT suggests that compost, when dry, is hydrophobic. Diesel contamination leads to a decrease in sorptivity compared to uncontaminated controls and wettability is not re-established following the addition of compost. Finally, the increase in compost volume (i.e. application rate) in the field samples leads to an increase in water repellency. The infiltration tests, carried out using a miniature tension infiltrometer, also illustrate different effects of hydrophobicity on infiltration, with some samples demonstrating reduced infiltration and low sorptivity but others showing no infiltration at all until the breakdown of repellency at later times.

This investigation is currently being complemented by a study of the influence of hydrophobic organic contaminant sequestration with time (i.e. ageing), estimated by measuring the changes in the available fraction of polycyclic aromatic hydrocarbons (PAHs), on the water repellency of compost amended brownfield soils.