SPATIAL HETEROGENEITY OF 2,6 DICHLOROBENZAMIDE DEGRADATION IN SOIL

O. Sjøholm1, J. Aamand2, J. Sørensen1, O. Nybroe1

1Genetics and Microbiology, Institute of Soil and Ecology, Faculty of Life Sciences, University of Copenhagen, Frederiksberg, Denmark
2Department of Geochemistry, Geological Survey of Denmark and Greenland, Copenhagen, Denmark

Background: The pesticide metabolite 2,6-dichlorobenzamide (BAM) is the most frequently encountered groundwater pollutant in Denmark. To gain further knowledge on the heterogeneity of degradation potential 3 plot sizes were examined and the presence of a known degrader was determined.

Objectives: We wanted to determine if the spatial variability in BAM degradation at different scales could be explained from a heterogenic distribution of degrader organisms, whether heterogeneity can be attributed to soil parameters or the occurrence of degrader organism and, if there is a correlation between degradation potential and aminobacter quantity.

Methods: Samples were taken at the scales 50, 1 and 0.01 m² from a location previously known to harbour BAM degraders. Samples were tested for mineralisation after addition of nanomolar concentrations of 14C labelled 2,6 dichlorobenzamide. The soil parameters TOC, NH₄⁺, NO₃⁻, water content and pH were determined. CFU was determined for the 0.01m² plot. MPN was used to quantify the degrader population and specific PCR primers were used to detect aminobacter in soil samples and MPN enrichments.

Results: Mineralisation of low concentrations (18-92 nmol kg⁻¹) of 14C labelled BAM showed immediate release of 14C-CO₂ in all samples and cumulative mineralisation ranging from 0.5 pmol g⁻¹ to 10.5 pmol g⁻¹ after 48 days. The degradation potential could not be explained from the environmental factors TOC, NH₄⁺, NO₃⁻, water content, CFU or pH. However, a strong correlation was found between mineralization rate (pmol g⁻¹ day⁻¹) and degrader abundance estimated by the most probable number method (MPN).

Conclusion:

• The heterogeneity of BAM degradation increased with decreasing plot size.
• A strong correlation existed between BAM mineralization rate and degrader abundance.
• Aminobacter bacteria were present at a low natural abundance but had a central role in the mineralization of BAM.