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Effect of Dissolved Organic Matter (DOM) on the degradation of atrazine in soil: batch and column experimental results and modeling.

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Dissolved Organic Matter (DOM) as a source of nutrients affects microbial activity and biodegradation of pesticides and thus the leaching of pesticides through soils. The presence of DOC in subsoils, where carbon sources are low, as a result of transport through the upper horizons is therefore of particular importance. We present results on the effect of the quality of DOM, on the degradation of atrazine by the endogenous microbial community of a carbon-poor subsoil in both batch and column experiments. The used soil was collected at a 30-45 *cm* depth from an agricultural field which had been treated with atrazine for more than 20 years. Batch experiments consisted of the soil suspended in a mineral medium non-limited for N and P and containing ^{14}C-ring-labeled atrazine. DOM was added from one of 4 different sources, i.e., glucose, Suwannee river Fulvic Acid (FA), a commercial Humic Acid (HA, Sigma-Aldrich), and a DOM solution collected from a field agricultural soil at 40 *cm* depth. DOM was added at 10 *mg/l*. The effect of DOM on atrazine mineralization was examined using cumulative production of ^{14}C-CO_2 from ^{14}C-atrazine during 64 days. Cumulative mineralization curves, established in triplicate for each condition, were fitted to the simplified Monod kinetic model to enable the identification of differences in lag-times and mass growth rates. Indications for a slight increase in modified mass growth rate were found for the batches with FA, HA and glucose (23.8, 25.5 and 25.2 $ml\ h^{-1}\ \mu g^{-1}$, respectively) compared to the control without DOM (22.5 $ml\ h^{-1}\ \mu g^{-1}$).

The modified mass growth rate found for the batches with the field DOM solution was significantly lower (21.2 $ml\ h^{-1}\ \mu g^{-1}$) than that found for the batches with HA and glucose. These results suggest that the quality of DOM only slightly affects the atrazine mineralization capacity of the microbial community and therefore only has a limited on the atrazine transport through the soil. To verify this, disturbed soil columns were set-up using the same soil. The columns are currently being percolated with an atrazine solution and either (i) no DOM, (ii) glucose as DOM source or (iii) a field DOM solution. Experimental and preliminary numerical results (using the simplified Monod kinetics and steady-state water flow) will be presented.