

Title of the dataset:

Data underlying Biostimulation is a valuable tool to assess pesticide biodegradation capacity of groundwater microorganisms

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Related publication:

Biostimulation is a valuable tool to assess pesticide biodegradation capacity of groundwater microorganisms <https://doi.org/10.1016/j.chemosphere.2021.130793>

Description:

Groundwater samples were collected at a drinking water abstraction aquifer at two locations, five different depths. Biodegradation of the MPs BAM, MCPP and 2,4-D was assessed in microcosms with groundwater samples, either without amendment, or amended with electron acceptor (nitrate or oxygen) and/or carbon substrate (dissolved organic carbon (DOC)). Oxygen + DOC was the most successful amendment resulting in complete biodegradation of 2,4-D in all microcosms after 42 days. DOC was most likely used as a growth substrate that enhanced co-metabolic 2,4-D degradation with oxygen as electron acceptor.

Set-up of biostimulation experiment. Five sets of amendments were applied to 10 different groundwater samples (22 and 23 depths 1-5). Triplicates were used for all sets.

Sample	Amendments	MPs (mg/L)*	DOC (mg C/L)**	Nitrate (mg/L) ***	Headspace (1.5 bar)
Ground -water (wells 22 and 23)	Nitrate + DOC	1	+ 15	30	Nitrogen
	Oxygen + DOC	1	+ 15	-	Pressurized air
	Oxygen	1	-	-	Pressurized air
	DOC	1	+ 15	-	Nitrogen
	Blank	1	-	-	Nitrogen
Control (no ground- water)	Nitrate + DOC	1	15	30	Nitrogen
	Oxygen + DOC	1	15	-	Pressurized air

* The spiking solution of MPs contained BAM, MCPP and 2,4-D, each at a concentration of 1 mg/L. **DOC was present in some of the groundwater samples, but equal amounts were added to all bottles. *** Nitrate was present in groundwater samples 23-1, 23-2 and 23-3 (Table1), so no extra nitrate was added to these bottles. (fAldas-Vargas et al 2021)

Keywords:

2,4-D

Biodegradation

Biostimulation

Degradation capacity

Pesticides

Groundwater

Spatial coverage:

Samples – Northeast of the Netherlands (exact location not available due to privacy regulations) – Well 22 and 23.

Temporal coverage:

Groundwater samples collected in November 2019

Analytical data obtained from mesocosms in 2019 and 2020

This dataset contains the following files:

1. Data_pesticides.xlsx contains all the pesticides monitoring data that was collected from the mesocosms during the experiment – BAM, 2,4-D and MCPP measurements from liquid chromatography (LC)

This file contains the following tabs:

- [1] BAM – BAM measurements in mg/L from the mesocosms
- [2] MCPP - MCPP measurements in mg/L from the mesocosms
- [3] 2,4-D – 2,4-D measurements in mg/L from the mesocosms
- [4] Graphs – degradation graphs

2. Graphs_O2_CO2.xlsx contains all the O₂ and CO₂ data in moles from the mesocosms

This file contains the following tabs:

- [1] O₂ – oxygen in moles from the mesocosms amended with oxygen
- [2] CO₂ – CO₂ in moles from the mesocosms amended
- [3] CO₂ production – summary of the CO₂ production in all mesocosm (yellow represents gas exchange days) calculated based on CO₂ measurements
- [4] O₂ consumption - summary of the O₂ consumption in oxygen amended mesocosms (yellow represents gas exchange days) calculated based on O₂ measurements

Explanation of variables:

T0-t7 – timepoints explained in following table from Aldas-Vargas et al 2021.

Table 3. Sampling days for the microcosms from groundwater samples (22 and 23 depths 1-5) and MQ samples.

	Well 22 (all microcosms)								Well 23 (all microcosms) and MQ (all microcosms)							
Liquid sample	0	14	42	56	85	109	146	210	0	14	42	56	84	111	148	212
Gas sample	7	14	34	50	91	111	148	213	7	14	34	50	91	111	148	213

The samples are denoted as e.g. 22-1 N1 which has the following meaning:

22	1	N	1
Well number 22 or 23	Well depth 1-5	Amendment added	Replicate 1-3

Amendments can also be:

O- oxygen

OD – oxygen and DOC

D – DOC

B – blank (no amendment)

Methods, materials and software:

Data_pesticides – data generated with LC (methods described in article)

graphs_O2_CO2 – data generated with GC (methods described in article)

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