

Title of the dataset:

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

Creators:

Andrea Aldas-Vargas ORCID 0000-0002-5310-2743

Thomas van der Vooren

Contributors:

Huub H.M. Rijnaarts

Nora B. Sutton

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	210	0	14	42	56	84	111	148	212
Gas sample	7	14	34	50	91	111	148	213	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)

License:

This dataset is published under the CC BY (Attribution) license.

This license allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator.