

Potential extracellular enzyme activities

When using these data, please cite:

Mainka, M.; Bakker, L.; Maier, A.; Ruethers, J.; Bakke Westergaard, K.; Fior, S.; Frossard, A.; Griepentrog, M.; Van de Broek, M.; Wilken, F, Dötterl, S.; Alexander, J.; Magnabosco, C. (2025): Arctic Greening Database. v0.1. GFZ Data Services.
<https://doi.org/10.5880/fidgeo.2025.074>

Introduction

In this data sheet all measured potential extracellular enzyme activities data per soil plot soil horizon are shown. These data entail the sample id and the potential extracellular enzyme activities of β -glucosidase (BG), β -xylosidase (BX), alkaline phosphatase (AP), N-acetyl- β -glucosaminidase / chitinase (NAG), leucine aminopeptidase (LAP), phenol oxidase (PO), phenol peroxidase (PP).

Table 1. General information

project_name	ETH+ Arctic Greening
creation_date	2023-07-10
last_modification_date	2025-03-05
sampling_period	2022-07-09 – 2023-08-09
creator	Annina Maier
contact_1	annina.maier@usys.ethz.ch
contact_2	sdoetterl@usys.ethz.ch
number_samples	244
processing_status	complete
upload_status	complete

Table 2. Variable overview

variable	explanation	unit
sample_id	sample_id of a respective observation	-
BG	Potential extracellular enzyme activities of β -glucosidase of the bulk soil	nmol h ⁻¹ g soil ⁻¹
BX	Potential extracellular enzyme activities of β -Xylosidase of the bulk soil	nmol h ⁻¹ g soil ⁻¹
AP	Potential extracellular enzyme activities of alkaline phosphatase of the bulk soil	nmol h ⁻¹ g soil ⁻¹
NAG	Potential extracellular enzyme activities of N-acetyl- β -glucosaminidase / chitinase of the bulk soil	nmol h ⁻¹ g soil ⁻¹
LAP	Potential extracellular enzyme activities of leucine aminopeptidase of the bulk soil	nmol h ⁻¹ g soil ⁻¹
PO	Potential extracellular enzyme activities of phenol oxidase of the bulk soil	nmol h ⁻¹ g soil ⁻¹
PP	Potential extracellular enzyme activities of phenol peroxidase of the bulk soil	nmol h ⁻¹ g soil ⁻¹

Methods

Sample processing

Soil samples that were stored at -20 to -25 ° C were slightly thawed, crushed to 2 cm³ cubes and ca. 10–15 g subsamples were wet sieved in a sterile manner below < 2 mm.

Sample analysis

Potential extracellular enzyme activities

Potential extracellular enzyme activities of β -glucosidase (BG), β -Xylosidase (BX), Alkaline phosphatase (AP), N-Acetyl- β -Glucosaminidase / Chitinase (NAG), Leucine aminopeptidase (LAP) phenol oxidase (PO) and phenol peroxidase (PP) were measured according to a common microplate fluorescence and absorbance protocol. All enzyme assays, were fluorescence assays except PO and PP, which were absorbance assays.

2 g of fresh, < 2 mm sieved bulk soil was weighed into a 100 ml glass beaker. To this, 60 ml of a corresponding buffer solution (0.05 M acetate buffer for soil sample pH 4-6, 0.1 M trishydroxymethane for soil sample pH 7-9) was added. Mineral horizon soil samples were then homogenized using a magnetic stirrer for 30 s. Organic horizon soil samples were first homogenized using a blender for 30 s (ultra-turrax[®] 1700 W IKA) and then also agitated with a magnetic stirrer. 4 x 200 μ l sample slurry is pipetted from the slurry under agitation to 96-well plate (clear for fluorescence, black for absorbance assays) using a multichannel pipette (4/8 channels). After all samples were added to the different microplates, for the fluorescence assays 50 μ l of a respective 200 μ M substrate analogue solution (1 mM 4-MUB-b-D-glucopyranoside for BG, 1 mM 4-MUB- β -D-xylopyranoide for BX, 1 mM 4-MUB-phosphate for AP, 1 mM 4-MUB-N-acetyl-b-D-glucosaminide dihydrate for NAG, 1 mM L-leucine 7-amido-4-AMC for LAP, 1mM 4-methylumbelliferone for MUB standard, 1 mM 7-amino-4-methylcoumarine for AMC standard) was added to the sample slurries in the wells. For the PP assay, 10 μ l of 0.3 % H₂O₂ was added to the sample slurries in the wells before substrate analogue addition. For both absorbance assays 10 μ M substrate analogue solution (5 mM 3,4-dihydroxyphenylalanine (L-DOPA) for PP and PO) was added to the sample slurries in the wells. After the addition of the substrate analogues, each well plate was placed on a microplate shaker for 30s and subsequently covered with aluminium foil. The microlates were then placed on a microplate shaker inside an incubator at 7.8 °C for 2 h. Immediately before measurement 10 μ l of 0.5 N NaOH are added to each well to increase the pH and the samples are then measured on a microplate reader (TECAN Infinite 200 PRO). The fluorescence assays for BG, BX, AP and NAG are measured at a wavelength of 445 nm, LAP at 450 nm. PO and PP absorbance assays are measured at 460 nm.

References

NA