Linking microbial communities to soil carbon cycling under anthropogenic change using a trait-based framework

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Microbes are key players in terrestrial carbon cycle.
Microbial framework to infer life history strategies

Malik et al., 2020, ISME Journal
Y-A-S framework to infer life history strategies

Malik et al., 2020, ISME Journal
Microbial traits across land use gradients

56 sites with varying land use
3 replicates at each site

Malik et al., 2018, Nature Communications
Microbial physiological response to land use intensification

"Pristine" grassland  →  Arable cropland
Microbial ecophysiology can be linked to soil C

Because we observed pH dependent patterns in both

Subset pH > 6.2 in both

11 paired contrasts

Malik et al., 2018, Nature Communications
Increased enzyme investment was linked to reduced yield

Malik et al., 2019, Soil Biology & Biochemistry
Strategies:
- High growth yield
- Resource acquisition
- Stress tolerance
Microbial traits across a precipitation gradient
Impact of drought on microbial traits and decomposition

Strategies:
- High growth yield
- Resource acquisition
- Stress tolerance

Malik et al., BioRxiv, 2019 (accepted, ISME Journal)
Microbial strategies for drought response

**Grass**

![Graph showing correlations between Ectoine and Aspartic acid, Ectoine and Adenosine.](image1)

**Shrub**

![Graph showing correlations between Ectoine and Aspartic acid, Ectoine and Adenosine.](image2)

log peak height/ml litter solution

Metabolomics-derived

Precipitation
- Ambient
- Reduced

Malik et al., BioRxiv, 2019 (accepted, ISME Journal)
Functional indicators of:

- Grass
- Reduced
- Ambient

Transcriptomics-derived

Word size represents the frequency of transcripts enriched in either treatments

Malik et al., BioRxiv, 2019 (accepted, ISME Journal)
We define key microbial trait-based life history strategies

We empirically validated the Y-A-S framework

Carbon storage through increased microbial growth yield

Trade-offs between drought stress tolerance & growth yield
#natureonourdoorstep

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