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Combined meta'omics reveal links among fungal community composition, gene expression, and chemical changes in decomposing leaf litter

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Introduction – Nutrient cycle in forests



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Introduction – Decomposition as a key process in the nutrient cycle



Introduction – Controlling factors

Organic matter Decomposition Decomposition products



Decomposition products

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Introduction – Controlling factors



Introduction – Climate



Parton et al. (2007), Science

CLIMATE

QUALITY

DECOMPOSER ACTIVITY

Litter inputs

Decomposition products





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Decomposition products





de Souza (2013), InTech



Schematic view of lignin Glazer and Nikaido (2007), Cambridge Univ. Press



Schematic view of lignin Glazer and Nikaido (2007), Cambridge Univ. Press





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Mass loss (%) Carbon content (%) Nitrogen content (%) Total phenolics Hemi-cellulose Cellulose Lignin Soil properties (pH) Nutrient content (K, P, NH₄⁺, NO₃⁻)





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Ethyl acetate

Nuclear Magnetic Resonance (NMR) spectroscopy





Bulk

parameters

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Nuclear Magnetic Resonance (NMR) spectroscopy

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Introduction – Litter quality

Introduction – Decomposer activity

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Talbot et al. (2014), PNAS

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Material and Methods

Material and Methods

Results – Communities are structured differently

Results – Leaves and litter are chemically distinct

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Results – Chemical composition becomes more similar with ongoing decomposition

Results – Identification of correlative relationships between individuals, enzyme transcription and chemical changes

based on Spectral Database for Organic Compounds

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Results – Identification of correlative relationships between individuals, enzyme transcription and chemical changes

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Summary

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Linking decomposer activity to decomposition

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Relative distribution (%)

Litter inputs

Decomposition products

Relative distribution (%)

Litter inputs

Relative distribution (%)

Discussion – Community disturbance

Adapted from Allison and Martiny (2008), PNAS