DIVERFARMING

Aromatic plants in vineyards

Crop diversification as a chance for promoting soil biodiversity and increasing economic revenues?

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GLOBAL SYMPOSIUM ON SOIL BIODIVERSITY | 19-22 April 2021

Background

- Common practice: **Intense tillage** and **bare soil** management below grapevines to prevent

a) Competition on water & nutrients

b) Fungal diseases (by dry canopy microclimate)

- ➢ Soil erosion
- ➢ Loss of soil organic matter & soil habitats

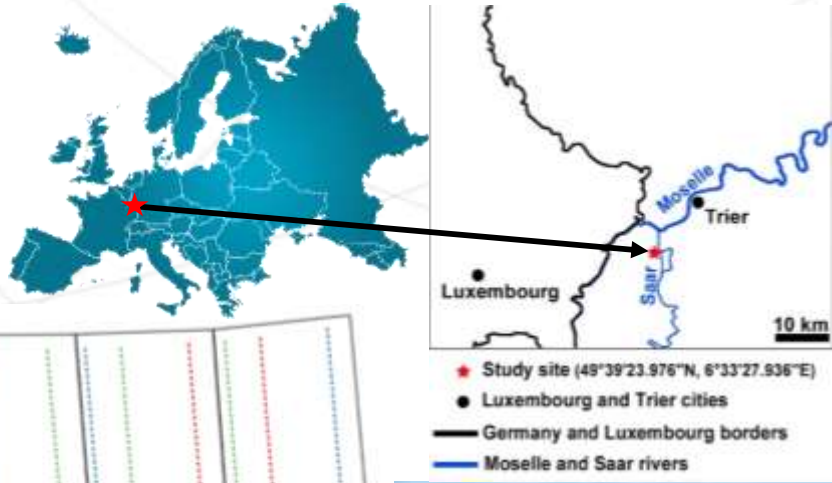
Why diversifying vineyards with aromatic plants?

- Adapted to pedoclimate
- Soil cover
- Root development
- Perennial growth
- low-growing habitus
- Low water demand
- Structural diversity
- Additional income

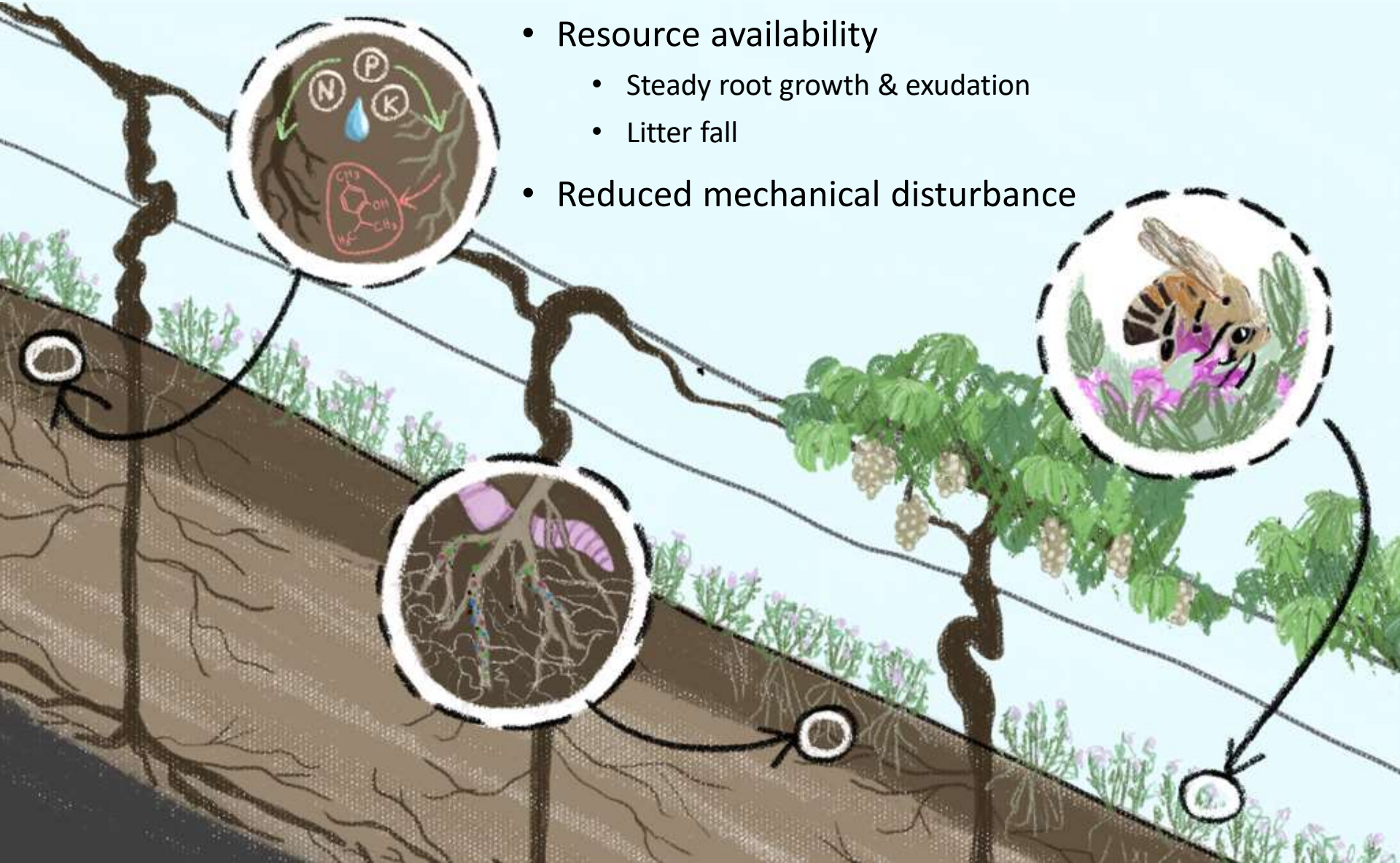



Material & Methods

- Aromatic plants established in April 2018
- Control = regular mechanical tillage
- Continuous monitoring of
  - Soil quality indicators
    - Soil organic matter
    - Microbial biomass
    - Microbial activity (i.e. enzymes)
    - Microbial community structure (NGS/PLFA)
    - Earthworm abundance and diversity
    - Nutrients, pH, EC,…
  - Crop growth and quality
  - Soil erosion
  - Insect abundance and diversity



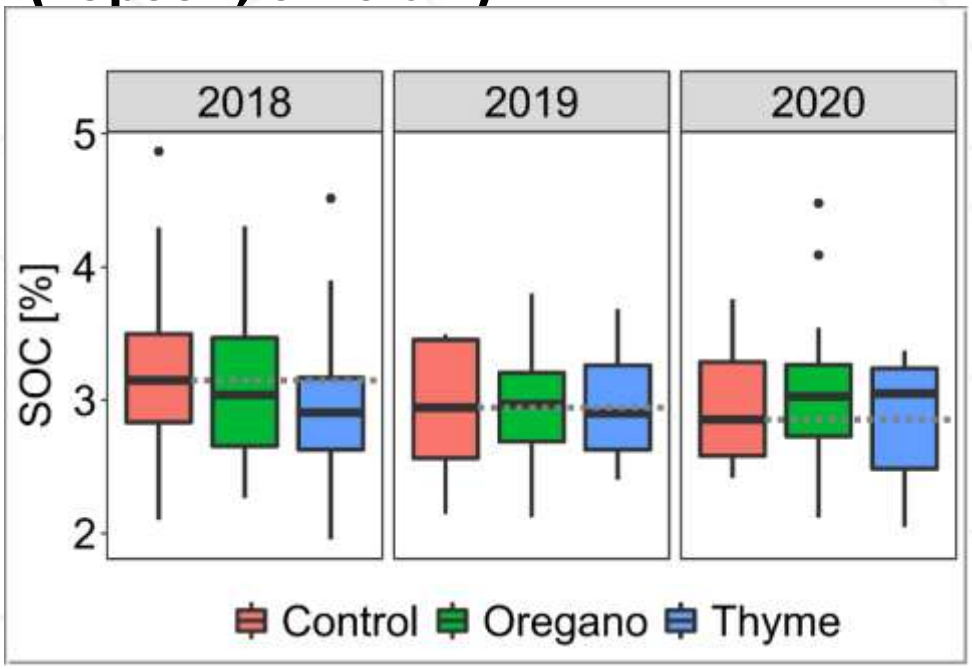
Characteristics of the **diversified vineyard soil habitat**



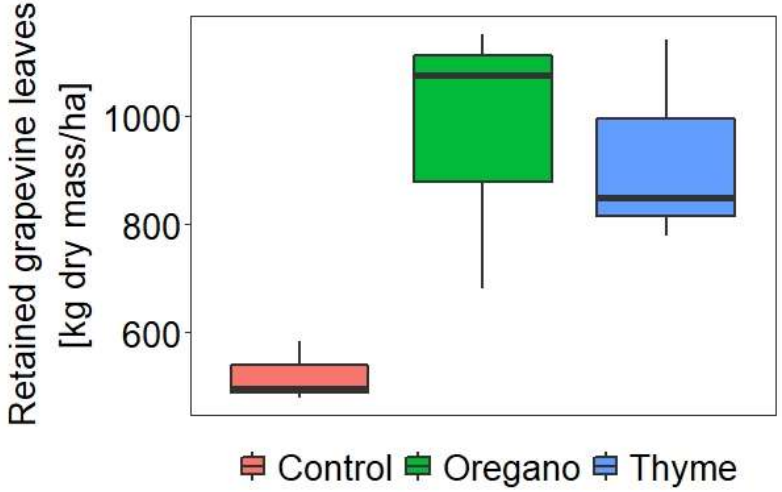
- Resource availability
  - Steady root growth & exudation
  - Litter fall
- Reduced mechanical disturbance

Soil Organic Matter

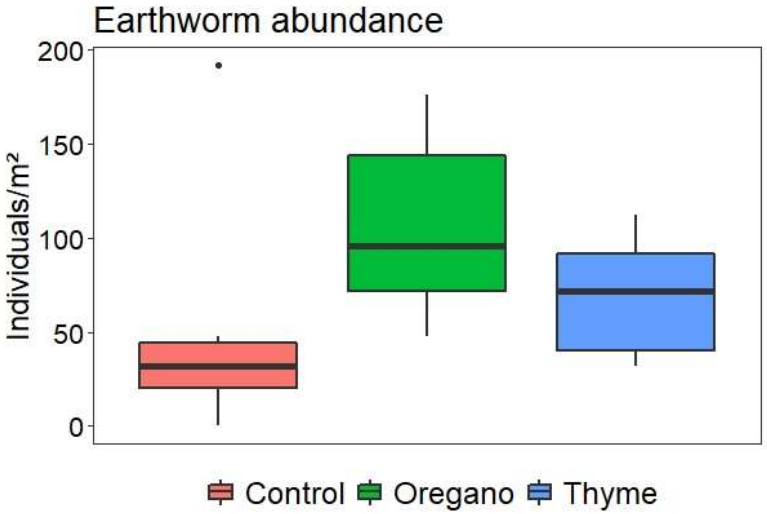
(Topsoil; 0-10 cm)

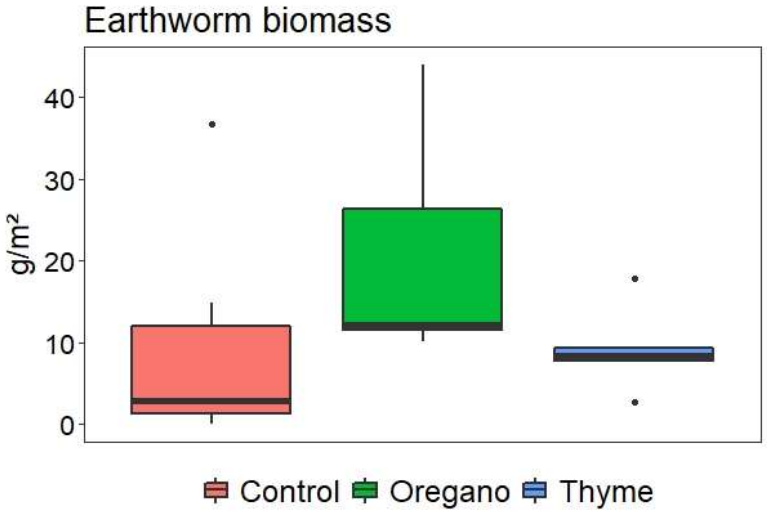


Physical barrier – Grapevine leave retention -
→ OM input



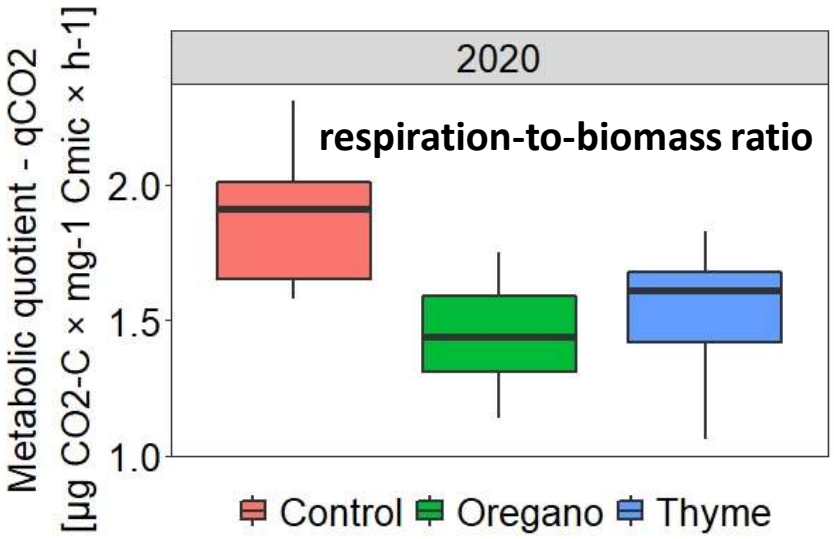
Earthworms in the vineyard



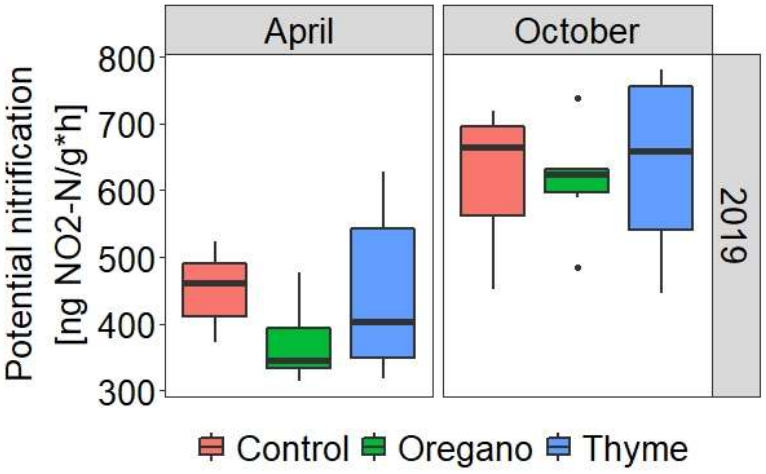


A. caliginosa underneath Oregano

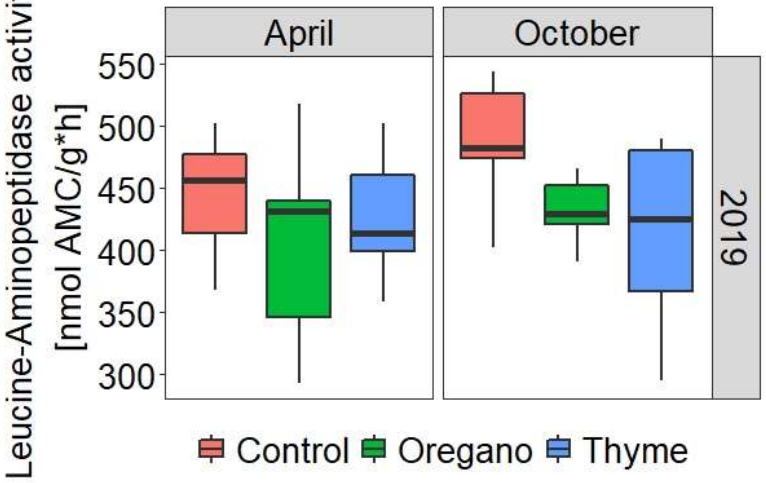
…and the microbes ?



→ **Increased C-efficiency**



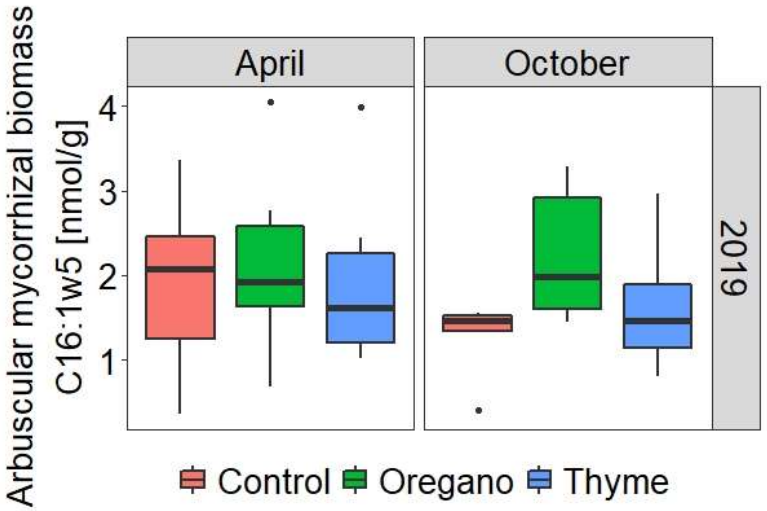
→ **Slowdown of N-transformation**

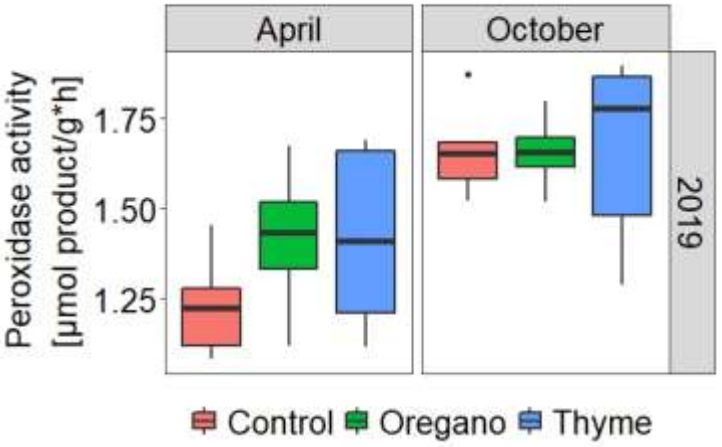


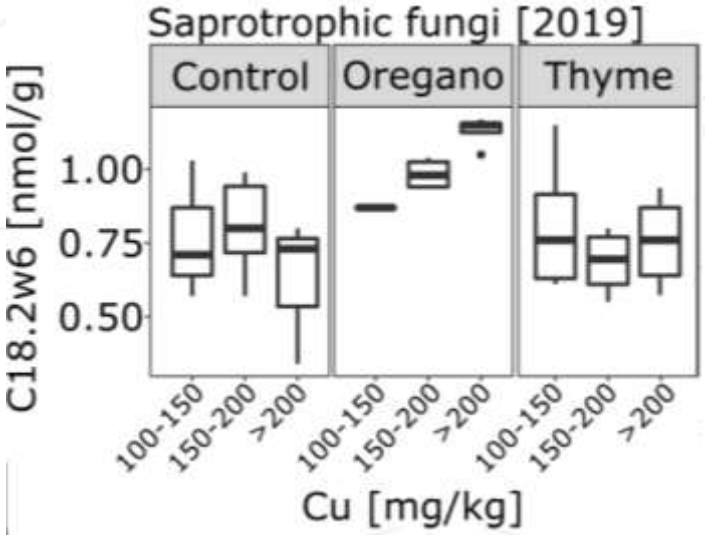
Smolander et al., 2012:

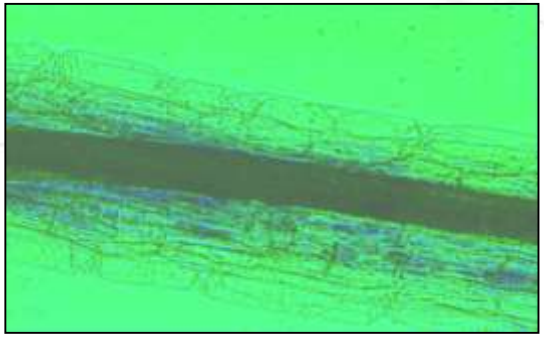
- „Terpenes […] probably provide a C source to part of the soil microbial population but are toxic to another part.“

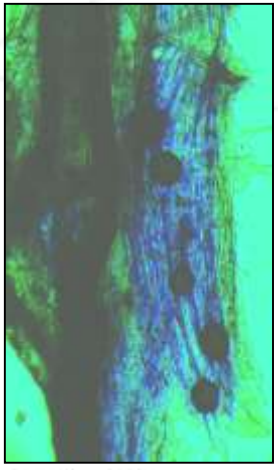
…and the microbes (II) ?











Ink-stained roots of aromatic plants

Summary & outlook

- **Crop diversification provides undisturbed, vegetated refuges and increases soil habitat & resource diversity**
- Helps to protect soil & promote soil life!

- ↑ Activities associated with carbon cycling performed by fungi
- ↓ Activities associated with nitrogen cycling
- Mitigation of ecotoxicity induced by Cu-based fungicides

- How does the taxonomic diversity respond as revealed by NGS?
- Which ecosystem services will be provided by a modified microbiome?

Thank you for your attention!

Special thanks go to

Weingut Dr. Frey Kanzem / Saar

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HORIZON 2020

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