

# Recurrent drought imprints ecological memory on microbial carbon allocation

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## Background

### Drought

- leads to osmotic stress and restricts access to carbon and nutrients <sup>1</sup>
- **reduces bacterial growth** by 50% <sup>2</sup>
- has less impact on actinobacteria and fungi <sup>2,3</sup>

### Recurrent drought

- **can induce ecological memory effects** on microbial community composition and functioning <sup>4</sup>

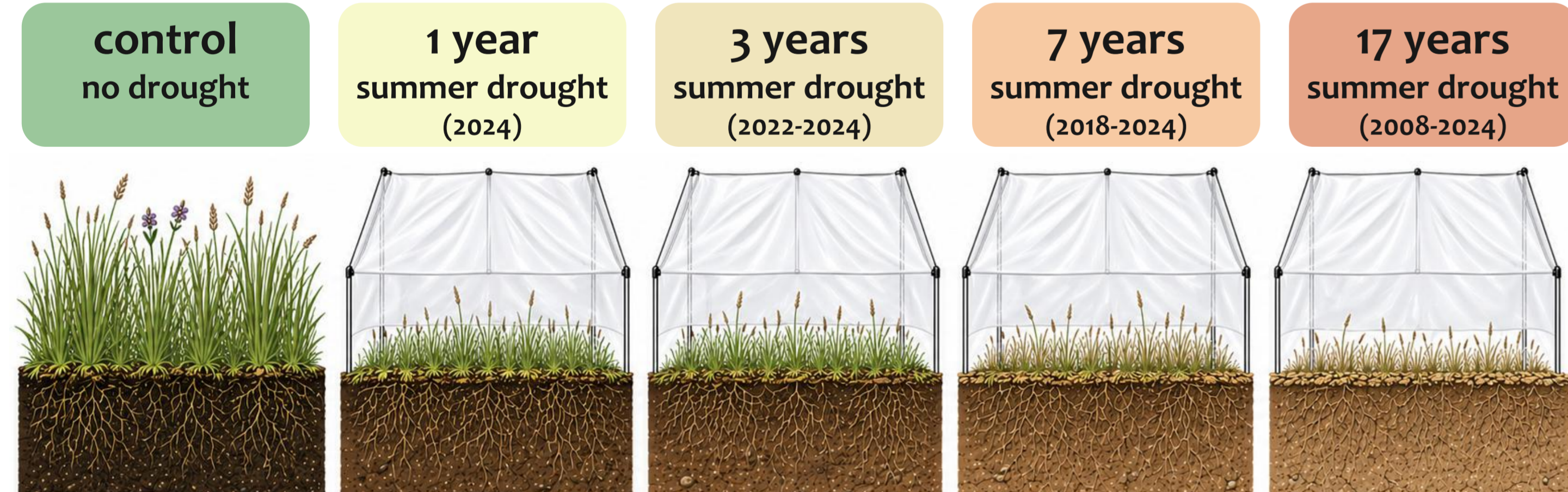
## Research Question

How does drought history change microbial C allocation?

## Experimental Design

- **long-term field drought experiment**
- mountainous grassland (Tyrol, Austria)
- rain-out shelters during summer (6-8 weeks)
- sampling in July 2024

INCREASING DROUGHT HISTORY

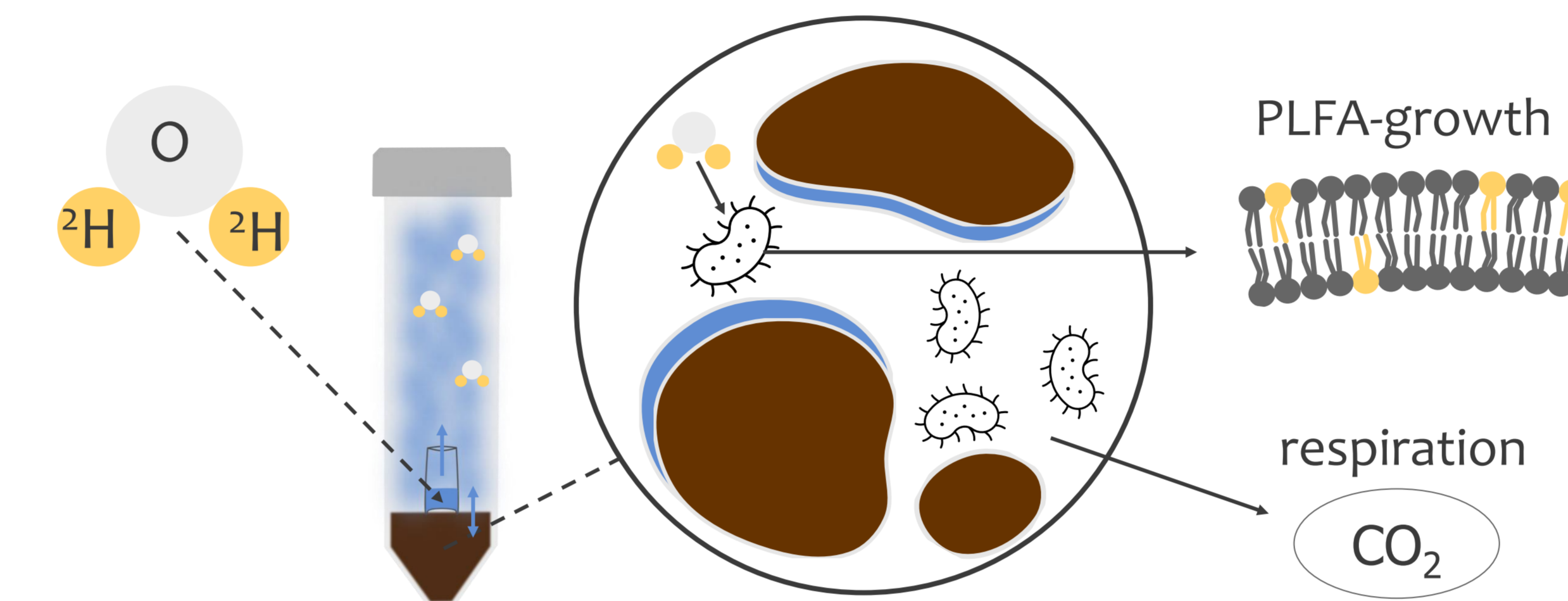


OpenAI 2026 ChatGPT Image generation tool openai.com

## Method

<sup>2</sup>H-FAME-SIP <sup>3</sup>

deuterium water vapor stable isotope probing of phospholipid fatty acids (PLFAs)



## Additional Findings

- Recurrent drought cumulatively **reduces total microbial growth and respiration rates**
- Growth rates of Gram-positive and Gram-negative bacteria decline progressively with drought history
- Actinobacteria are less affected but still decline
- **Fungal growth remains stable** across drought histories

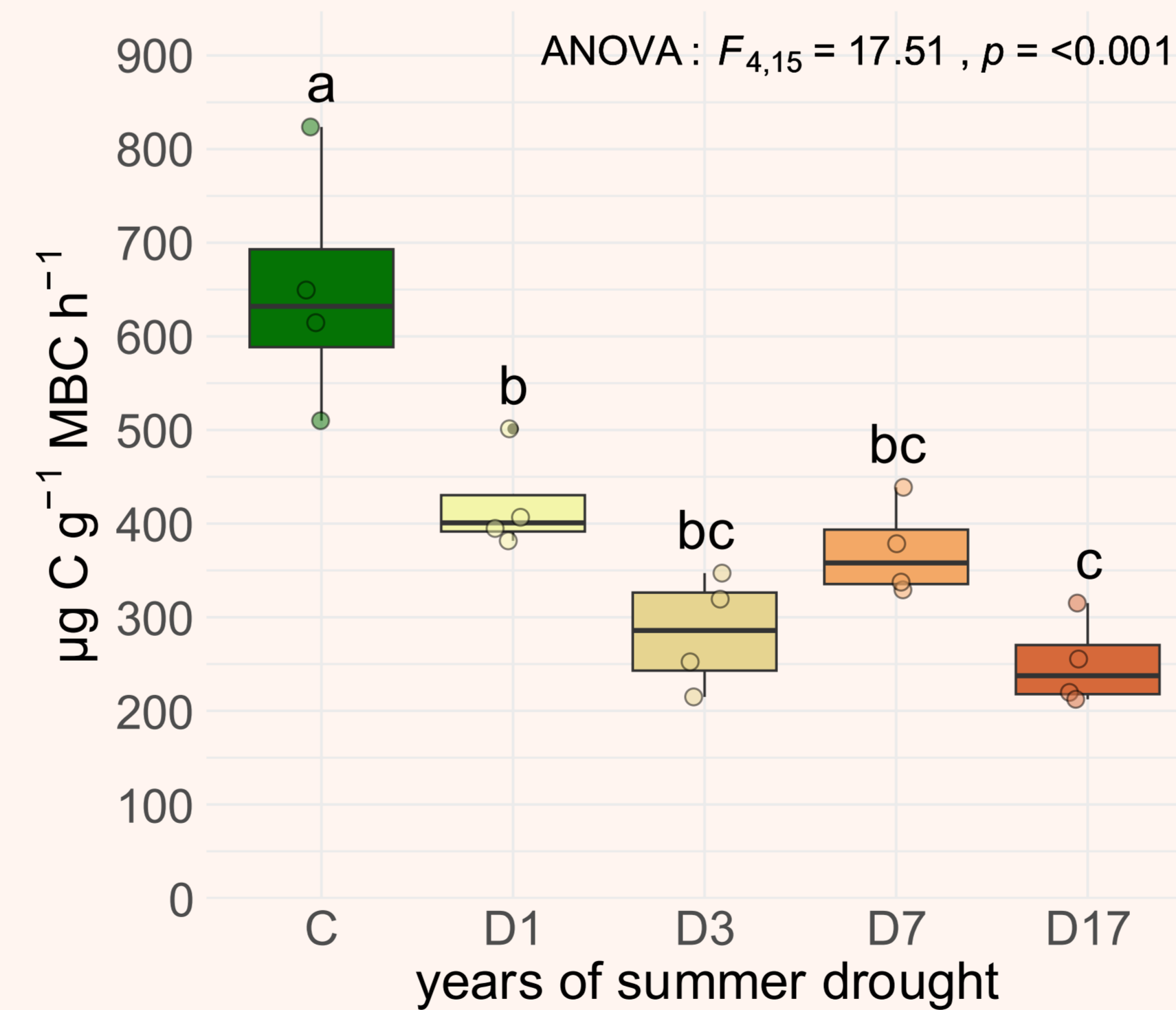
## Ongoing Data Analysis

- microbial storage compound synthesis
- neutral lipid fatty acids
- poly-3-hydroxybutyrate

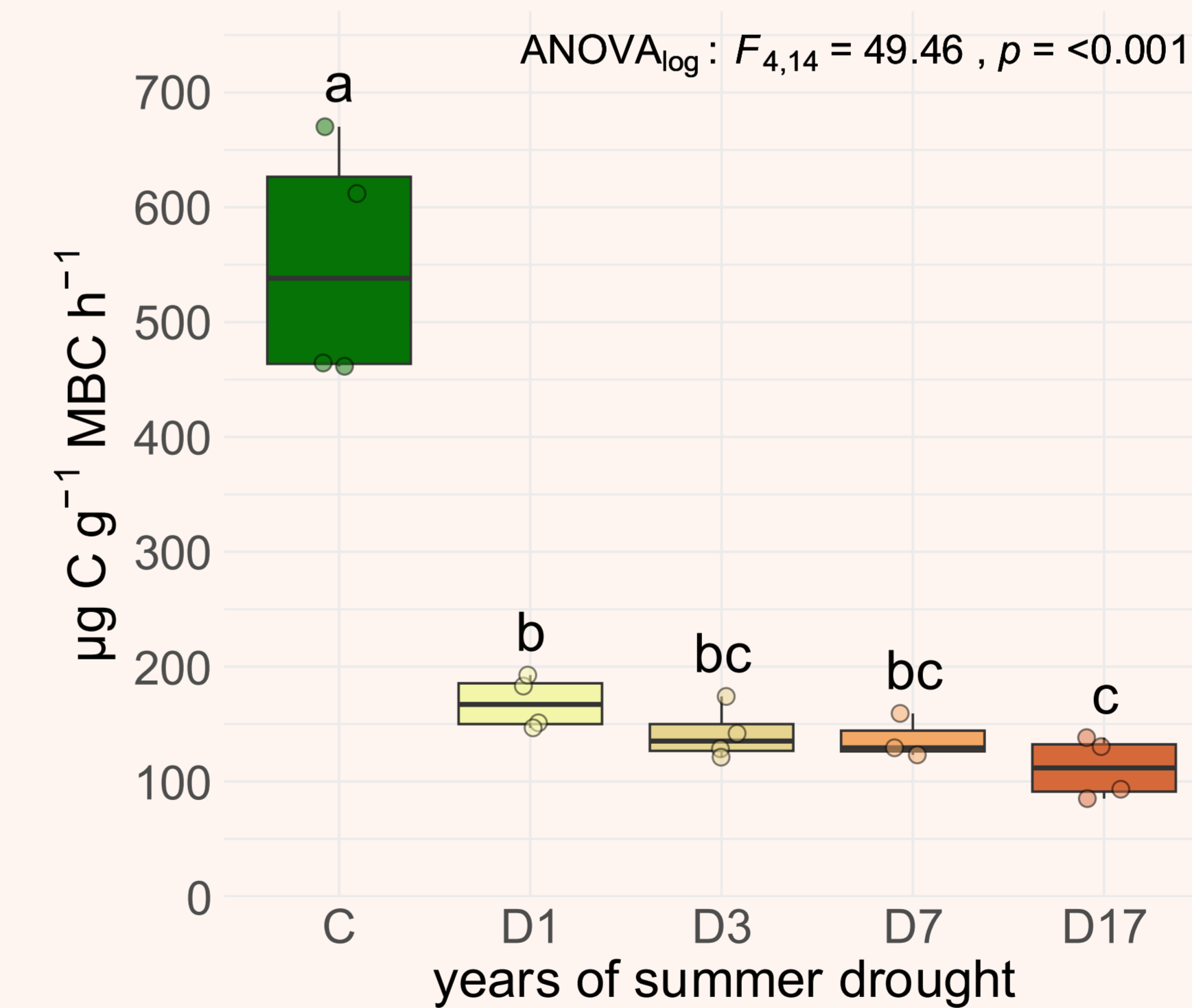


## Main Results

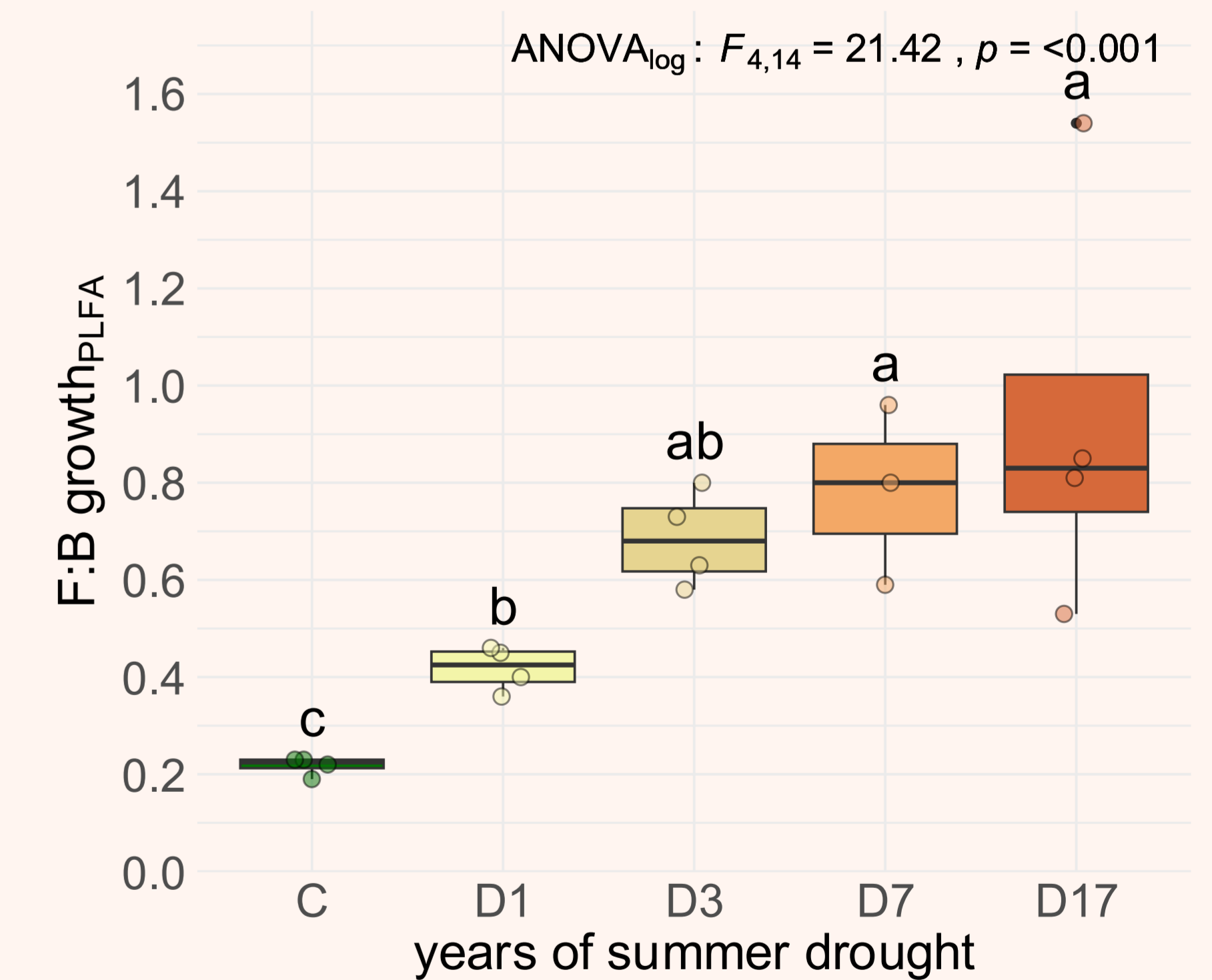
### Microbial respiration<sub>mass-specific</sub>



### Microbial PLFA-growth<sub>mass-specific</sub>



### Fungal:Bacterial PLFA-growth



## Let's connect!

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## References

- <sup>1</sup> Schimel et al. 2018, Ann. Rev. Ecol. Evol. Sys. 49
- <sup>2</sup> Metz et al. 2023, Nature Communications 14
- <sup>3</sup> Canarini et al. 2024, Nature Communications 15
- <sup>4</sup> Canarini et al. 2021, Nature Communications 12

## Take Home Messages

- **Recurrent drought progressively reduces total microbial mass-specific growth and respiration**
- **Fungal growth remains relatively stable, shifting the community toward fungal dominance**

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