

Impact of Biopesticides on Soil Microbial Communities

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Bioherbicide for Christmas trees plantations

Despite natural origin of biopesticides, limited research exists on their environmental fate and ecotoxicological effects on non-target organisms (Amichot *et al.* 2024).

The European X-Tree project (EUROSTAR) introduces a sustainable cultural itinerary for Christmas tree production by integrating bio-based solution from APEO, which provides an essential-oil-derived bioherbicide to reduce weed competition, and ELICIR, which offers a plant-extract-derived biostimulant to enhance tree growth.

A bioherbicide, 1000 L/ha

with essential oil
(1.5%)

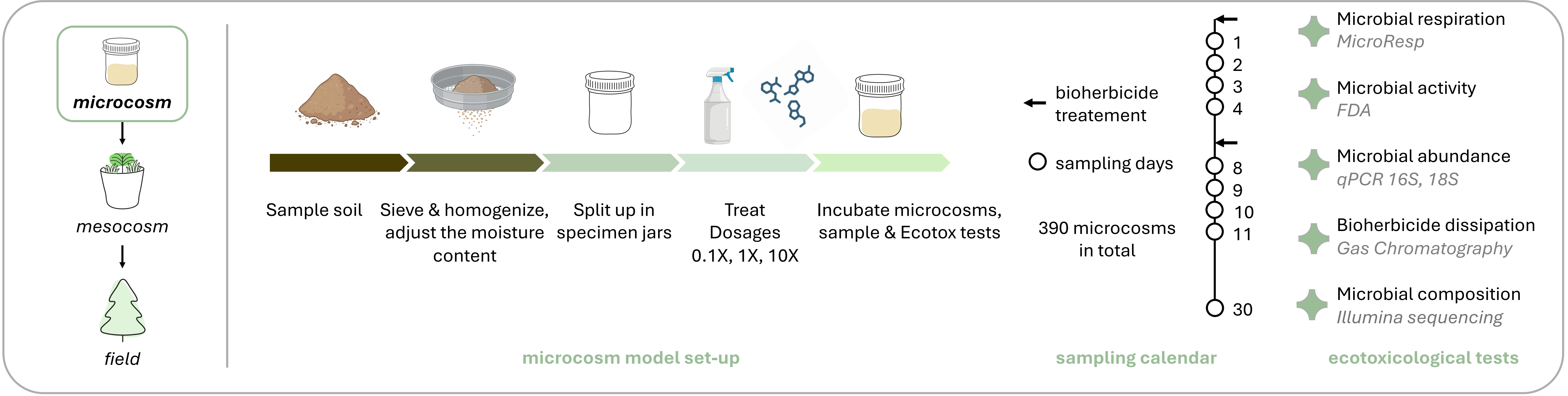


or

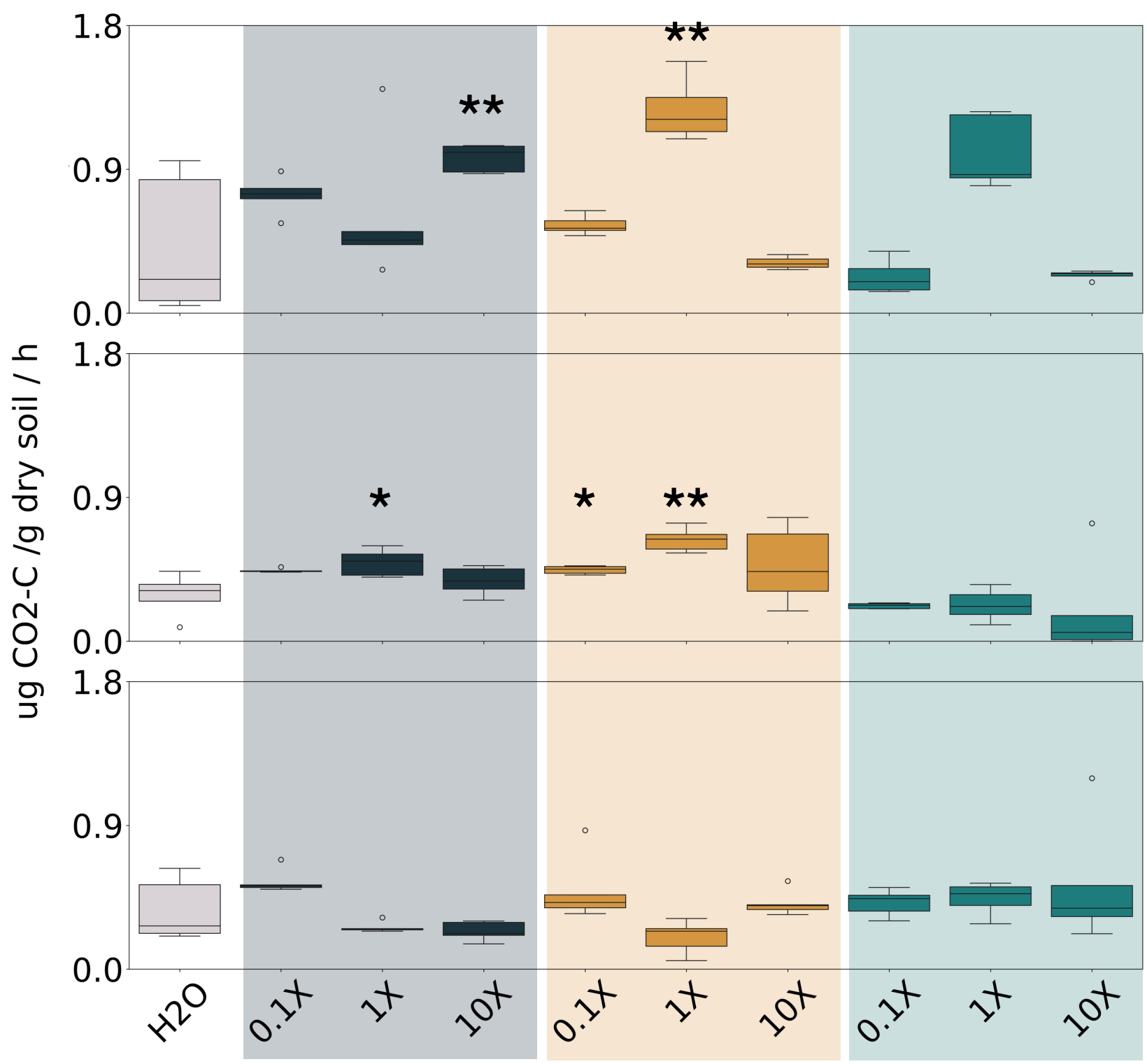
with its lead
compound (1.2%)



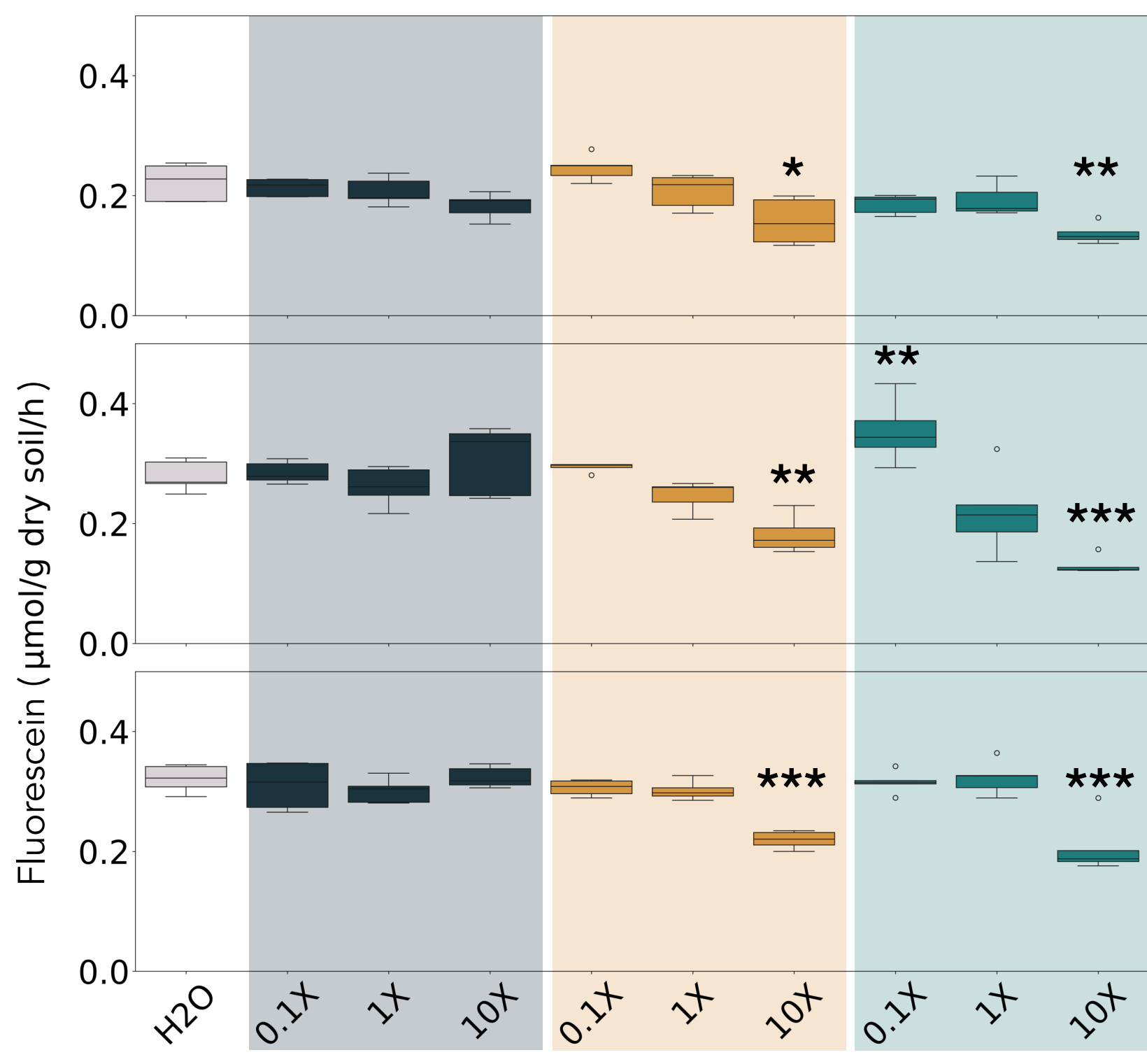
Lab-to-fied approach



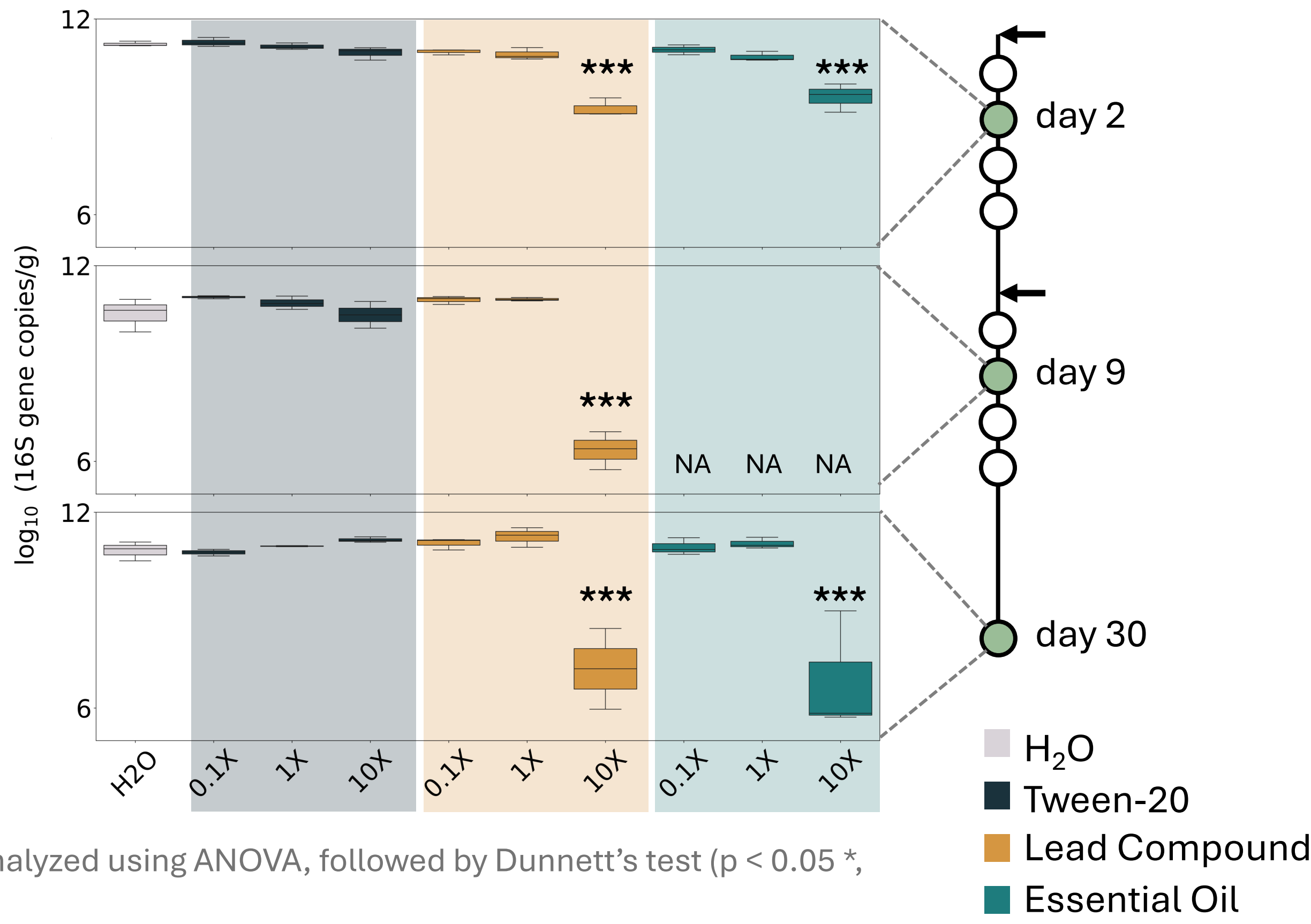
Microbial respiration



Microbial activity

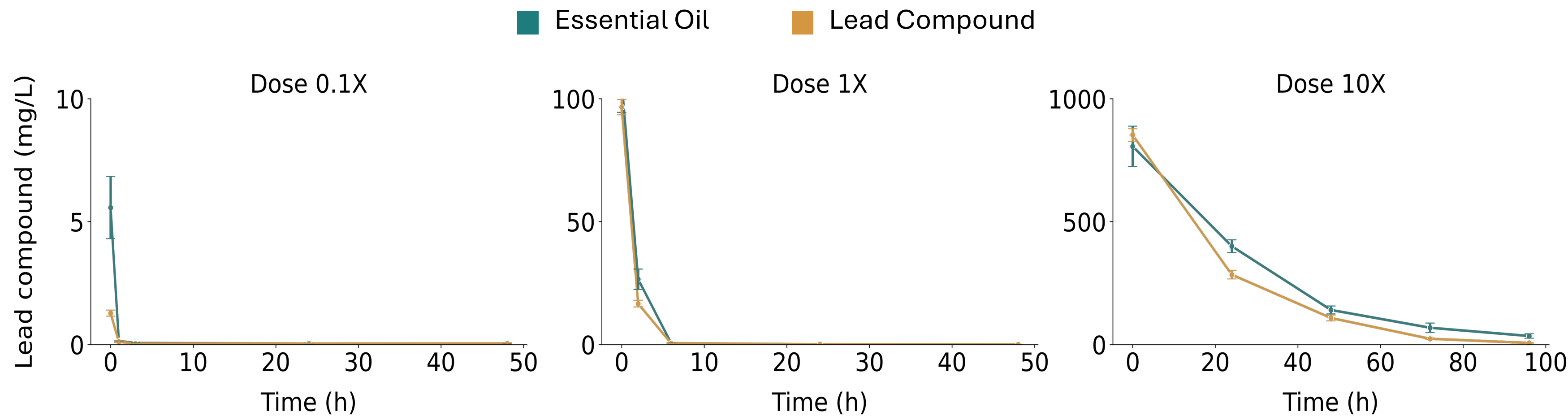


Bacterial abundance



Differences between treatments in raw data (n = 5 for microbial respiration and activity, n = 3 for microbial abundance) were analyzed using ANOVA, followed by Dunnett's test (p < 0.05 *, p < 0.01 **, p < 0.001 ***). "NA" indicates data not available.

Bioherbicide dissipation in soil microcosm

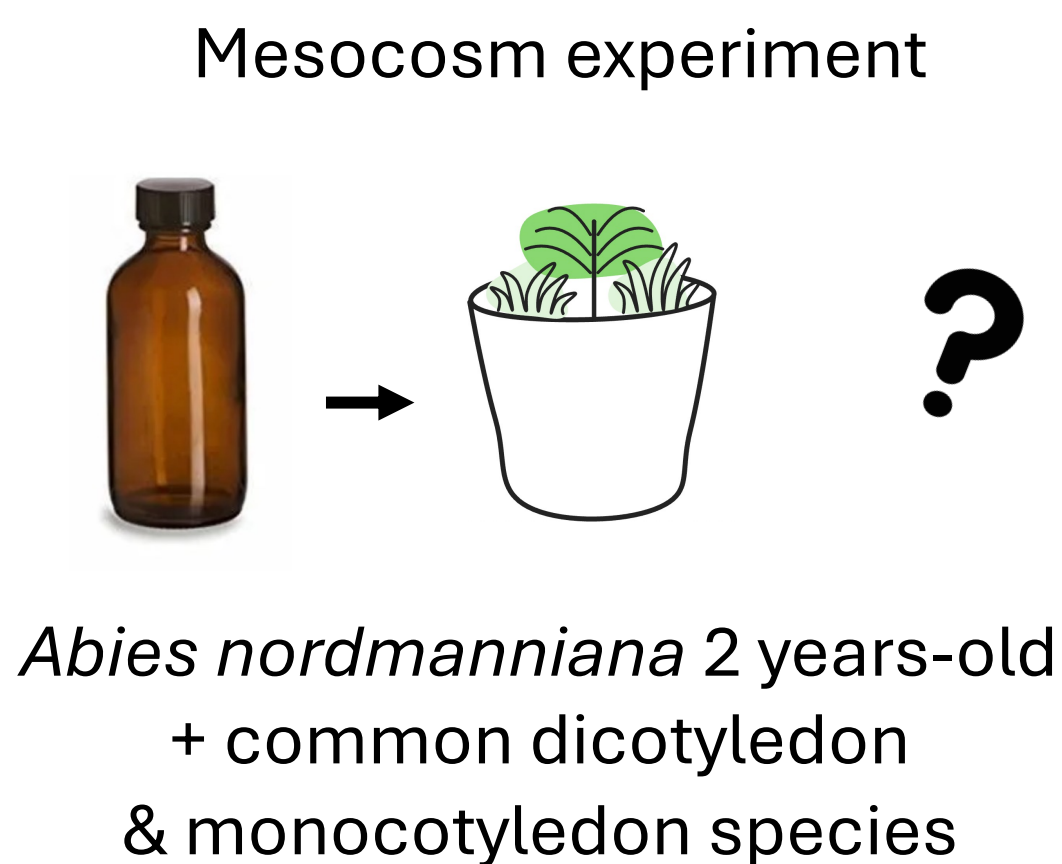


Product	Dose	Recovery (%)	Half-life (h)
Lead Compound	0.1X	15	-
	1X	112	1
	10X	99	19
Essential Oil	0.1X	65	0.5
	1X	124	1.3
	10X	93	24

Conclusion

- ✓ Low doses of lead compound: **↑ microbial respiration**
- ✓ **10X dose**: ↓ microbial activity & abundance (**toxicity**)
- ✓ Short-term effect of bioherbicide: **stability by day 30**
- ✓ Exception: 10X remains toxic over time
- ✓ **Rapid dissipation** of bioherbicide in soil (< 1 day)
- ✓ **Bio-based** products must be tested: they require **proper risk assessment**

Perspectives



References

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