

Can earthworms enhance mineral weathering and thereby increase carbon sequestration?

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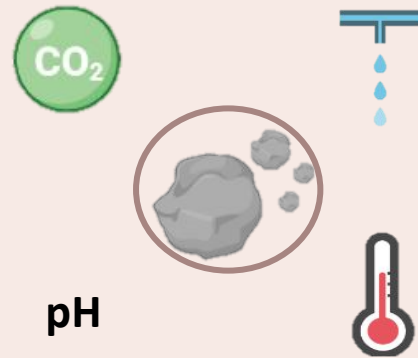
Negative Emissions Technologies (NETs)

Remove CO₂ from the atmosphere¹



Enhanced Silicate Weathering (ESW)

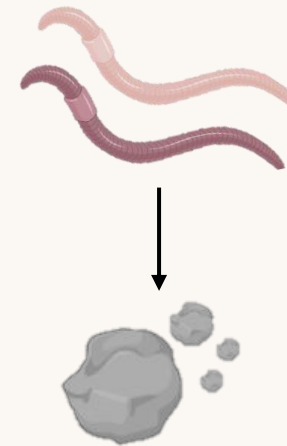
A NET with a yet unknown potential to mitigate climate change^{1,2}



Inorganic carbon sequestration

Role of soil biota in ESW

Soil biota can amplify ESW rates³

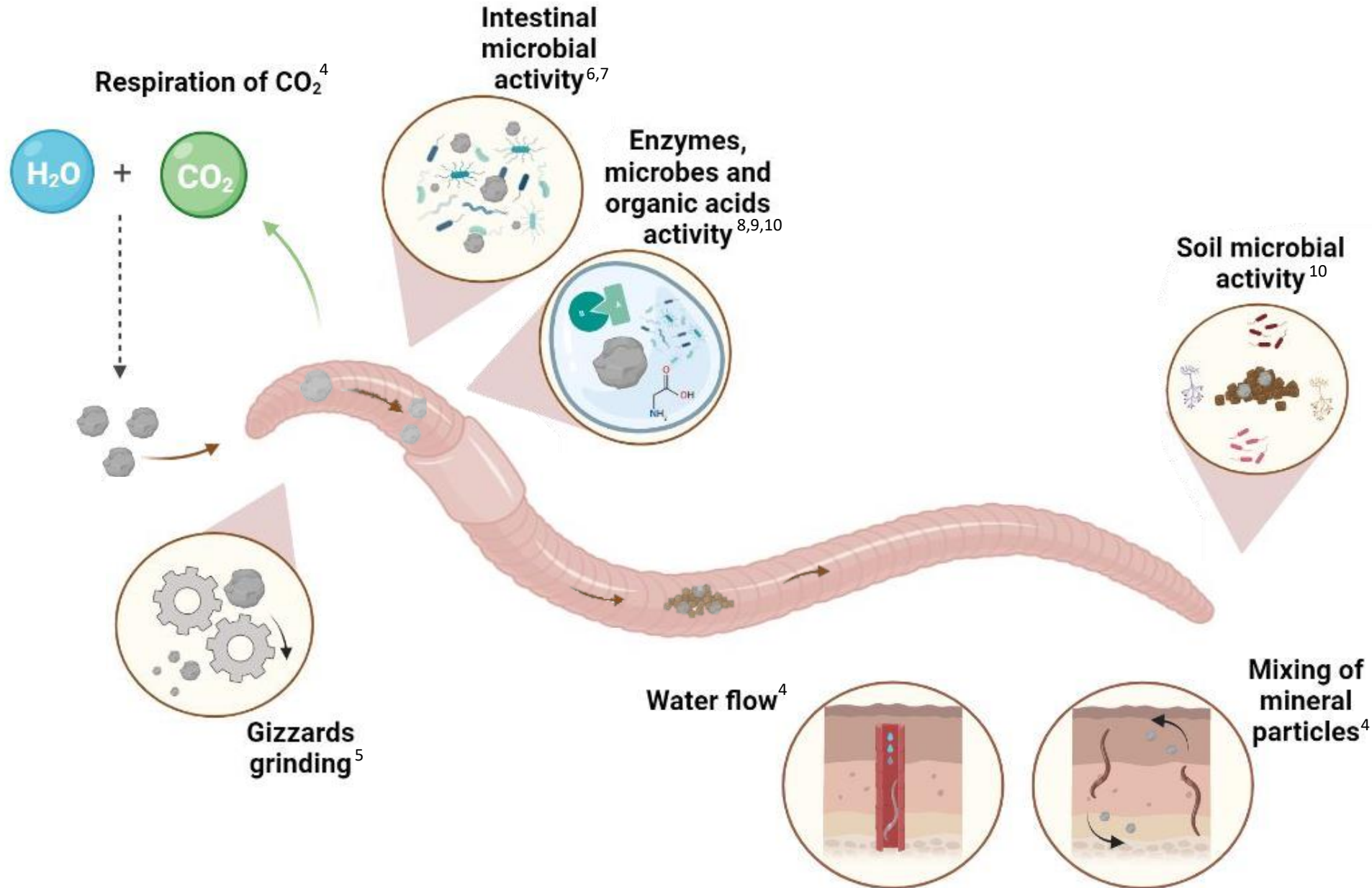


¹Fuss et al. (2018). Negative emissions—Part 2: Costs, potentials and side effects.

²Berling et al. (2020). Potential for large-scale CO₂ removal via enhanced rock weathering with croplands.

³Vicca et al. (2021). Is the climate change mitigation effect of enhanced silicate weathering governed by biological processes?





⁴Schwartzman (2015). The geobiology of weathering; a 13th hypothesis.

⁵Suzuki et al. (2003) Breakdown of mineral grains by earthworms and beetle larvae.

⁶Carpenter et al., (2008) The role of earthworm communities in soil mineral weathering.

⁷Georgiadis et al. (2019). Do earthworms affect the fractionation of silicon in soil?

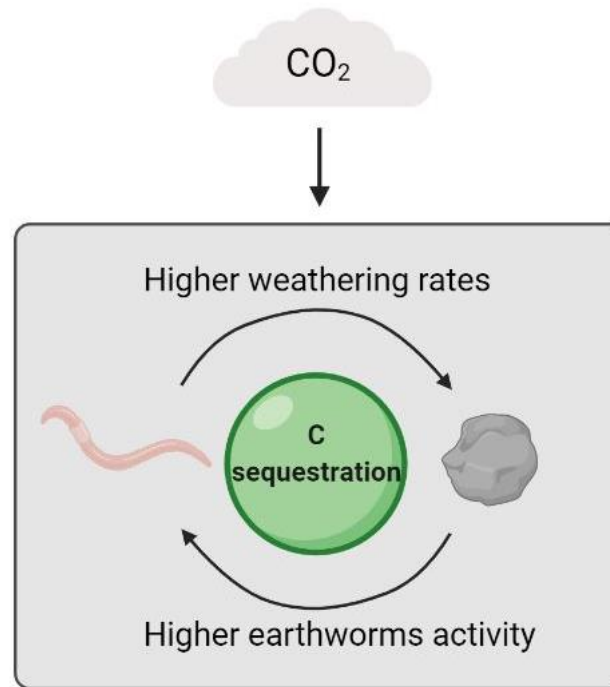
⁸Needham et al. (2004). Animal-sediment interactions: the effect of ingestion and excretion by worms on mineralogy.

⁹Carpenter et al. (2007). Earthworm induced mineral weathering: preliminary results.

¹⁰Liu et al. (2001). Degradation of potassium rock by earthworms and responses of bacterial communities in its gut and surrounding substrates after being fed with mineral.

BVM!

Bio-accelerated mineral weathering



Main aim: test the suitability of earthworms for an artificial system and optimal weathering conditions



I experiment



10 days



15.5 °C

2% Straw Hay Co-digestate



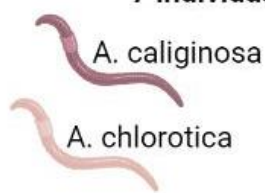
500 gr



Dunite

Basalt

7 individuals



A. caliginosa

A. chlorotica



Earthworm survival & activity



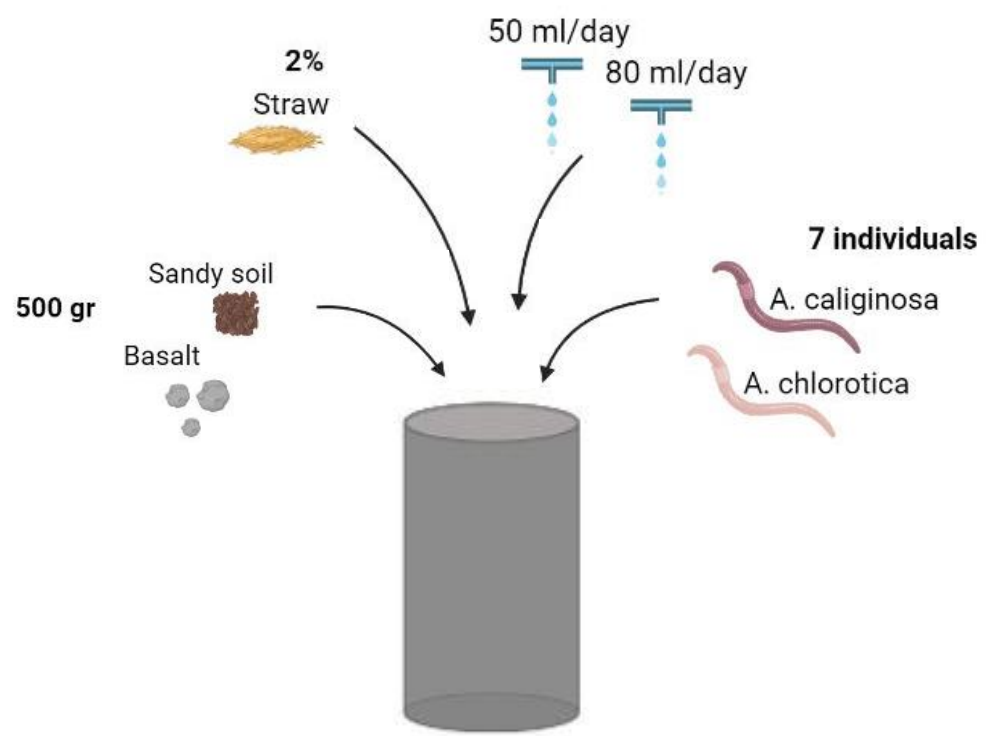
II experiment



14 days




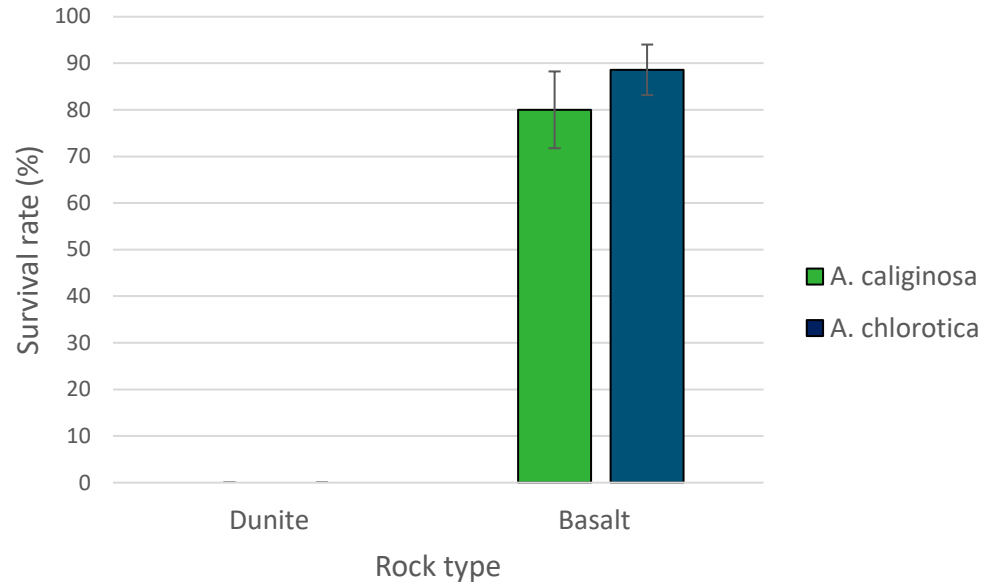
20 & 25 °C




Earthworm survival, growth & activity




Earthworms survival according to rock type



Basalt highly accepted by earthworms

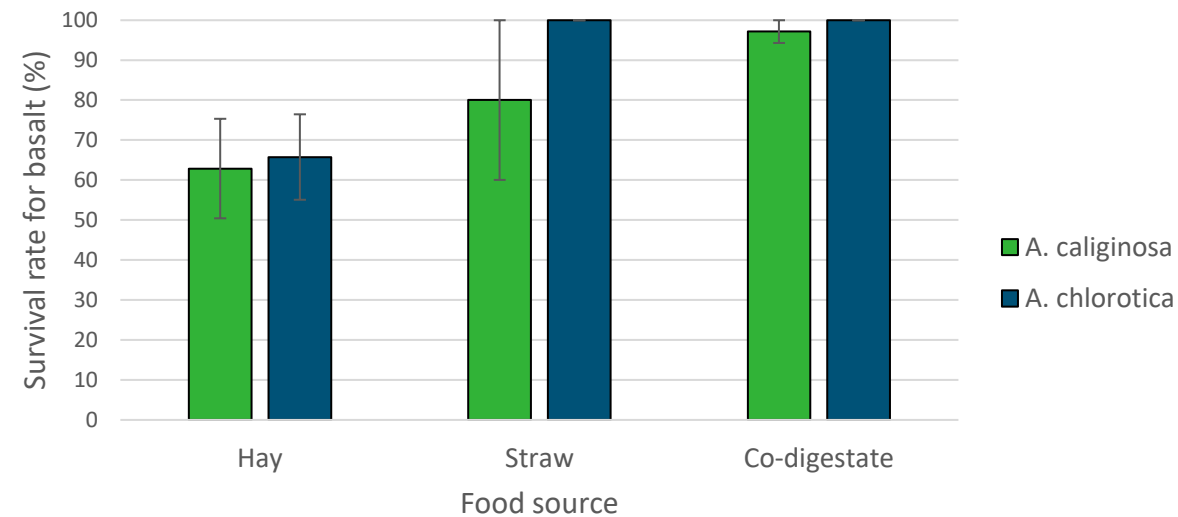


Hay is less preferred than straw and co-digestate

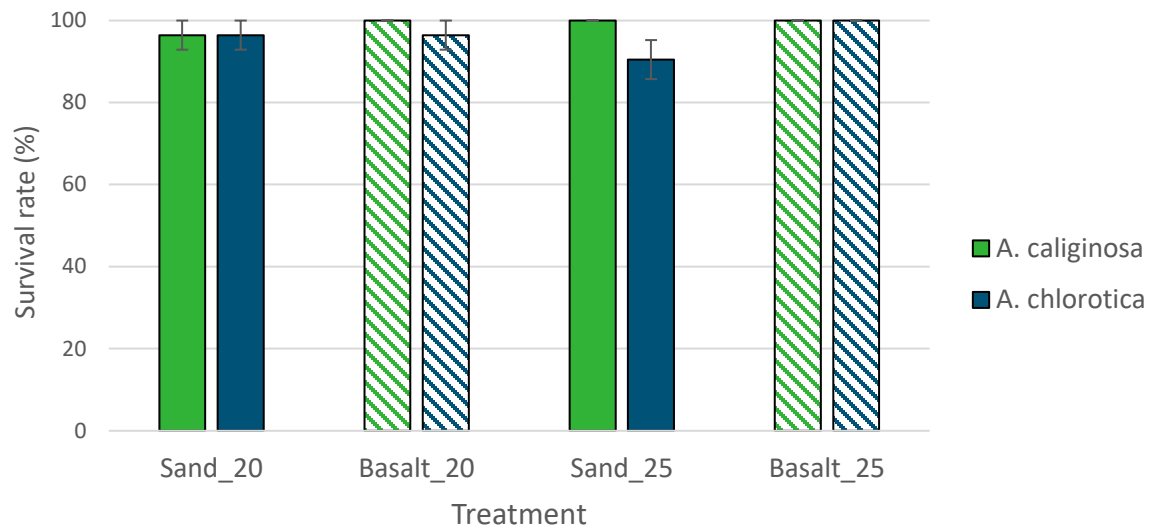


No significant differences between earthworm species

Earthworms survival according to food source



Earthworms survival according to temperature and substrate



No significant differences between temperatures

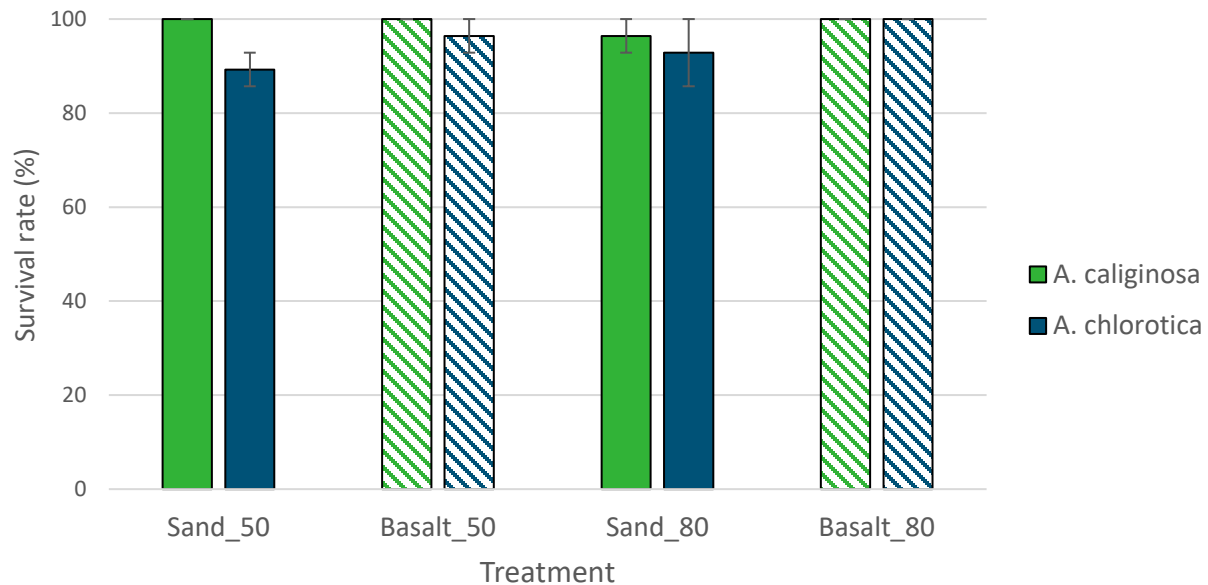


No significant differences between flow rates



No significant differences between earthworm species

Earthworms survival according to flow rate and substrate



Earthworms are suitable for an artificial system

Earthworms can tolerate physical conditions known for stimulating weathering

Future studies will elucidate the role of earthworms in enhanced weathering



Thank you for your attention!



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