Beneficial effects of naked amoebae (Acanthamoeba castellanii) on plant growth, nitrogen uptake and carbon assimilation varies with maize (Zea mays) cultivar

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Background

- Nitrogen (N) limits plant growth in most terrestrial ecosystems
- After mineralization, plant residues form a major source of N for plant growth
- Plants invest significant amounts of photosynthates into the rhizosphere, thereby enhancing microbial interactions
- Protozoa foster N uptake of numerous plant species by re-mobilizing N from bacterial biomass ('microbial loop' in soil)

Research Question

Do cultivars of plant species differentially affect the functioning of the 'microbial loop'?

Materials and Methods

Microcosms (Fig. 1):
- containing soil with a natural bacterial community
- ± axenic soil protozoa (naked amoeba; *Acanthamoeba castellanii, A*)
- with ^{15}N labelled litter ➔ plant uptake of N from plant residues in soil

Plants:
- three cultivars of *Zea mays (*MB862 (MB), Banguy and PR39T45 (PR))
- net CO_2 assimilation rates ➔ plant photosynthesis
- harvest after 2 weeks

Treatments:
- 3 cultivars of *Z. mays* ± *A. castellanii* (n = 4 per treatment)

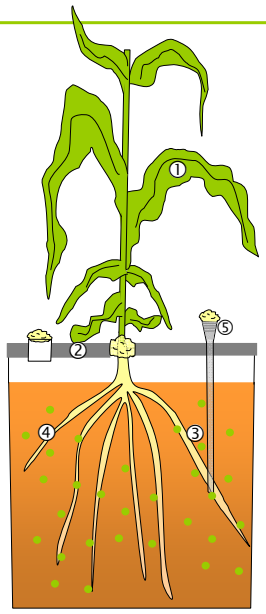
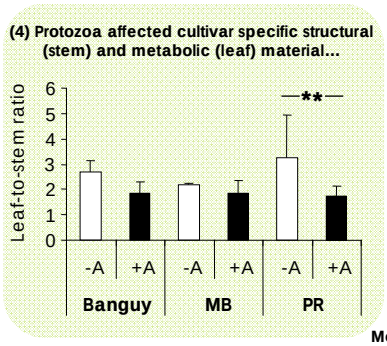
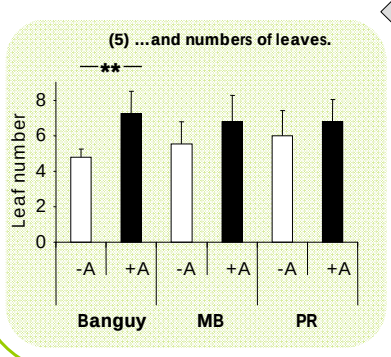


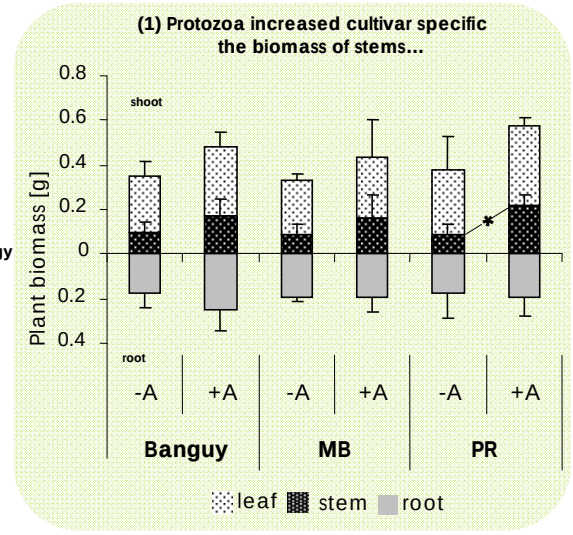
Fig. 1: microcosm set up (1) Shoot of *Zea mays* **(2)** airtight lid of the microcosm, perforated for plant growth and aeration of soil, sealed with sterile hydrophobic cotton **(3)** root of *Zea mays* **(4)** soil mixed with ^{15}N-labelled litter, autoclaved and re-inoculated with natural bacterial community **(5)** hypodermic needles inserted in the lid

Results



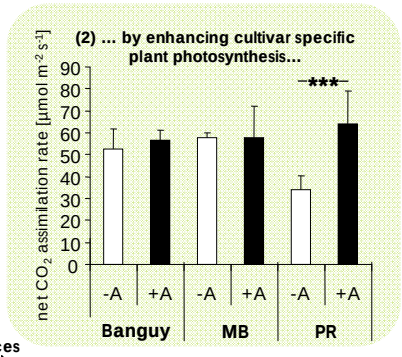


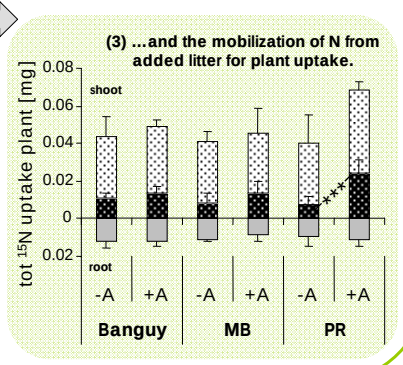
Morphology



—*— p < 0.05 —**— p < 0.01 —***— p < 0.001

Resources





Conclusions

- **Protozoa-plant interactions and the ‚microbial loop' strongly depend on the plant cultivar**
- **Cultivar specific plant-microbial interactions in the rhizosphere need to be considered to improve breeding strategies aiming to enhance N uptake and productivity of crops**

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