

# Fungal endophyte *Acremonium alternatum* helps to mitigate biotic and abiotic stress in plants

**Susann Auer**

Faculty of Biology, Institute of Botany, Chair for Plant Physiology [Susann.Auer@tu-dresden.de](mailto:Susann.Auer@tu-dresden.de) / Twitter: @SusannAuer

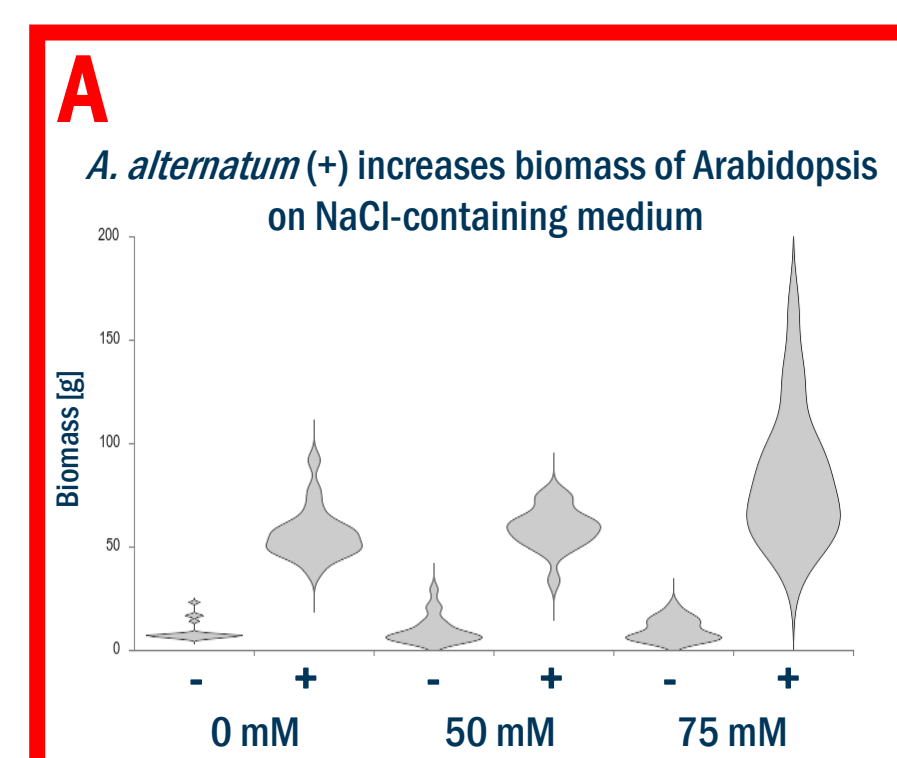
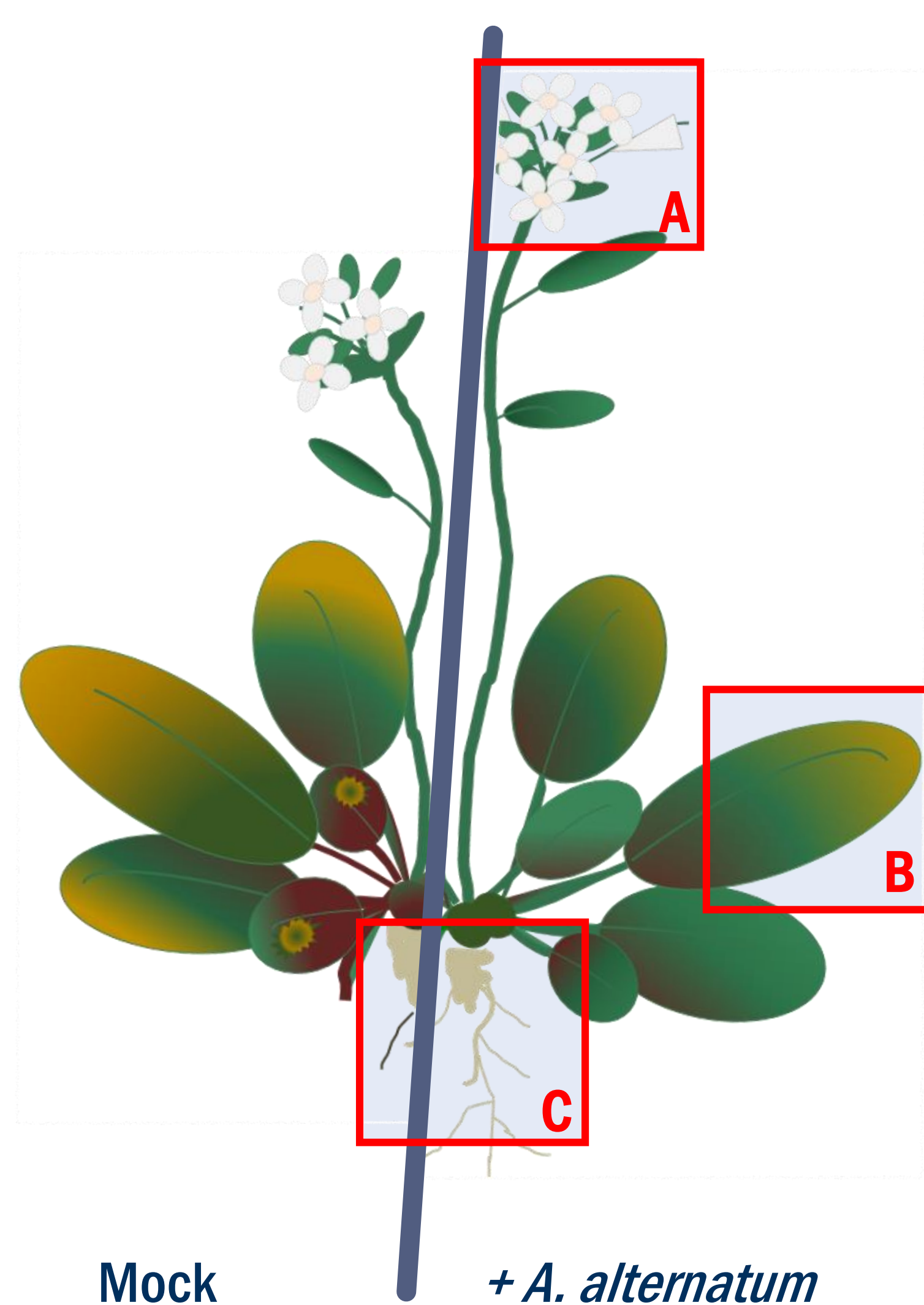
## Background

- Biocontrol agents can increase the stress tolerance of their host plants
- Endophytic fungus *Acremonium alternatum* partially controls foliar and root pathogens (mildew, tar spot, clubroot)<sup>1,2,3</sup>  
→ mechanism is unclear

## Questions

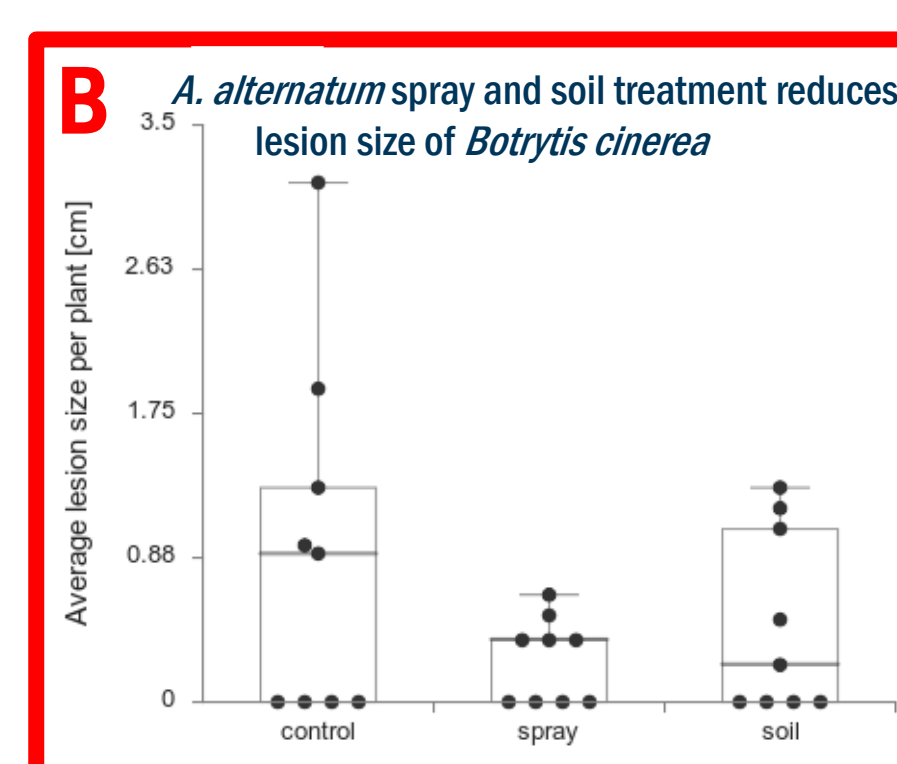
- Can *A. alternatum* reduce other biotic and abiotic stressors?  
→ biotic: clubroot in rapeseed and *Botrytis* in Arabidopsis  
→ abiotic: salt stress in Arabidopsis
- What is the molecular mechanism behind the biocontrol action of *A. alternatum*?

## Results



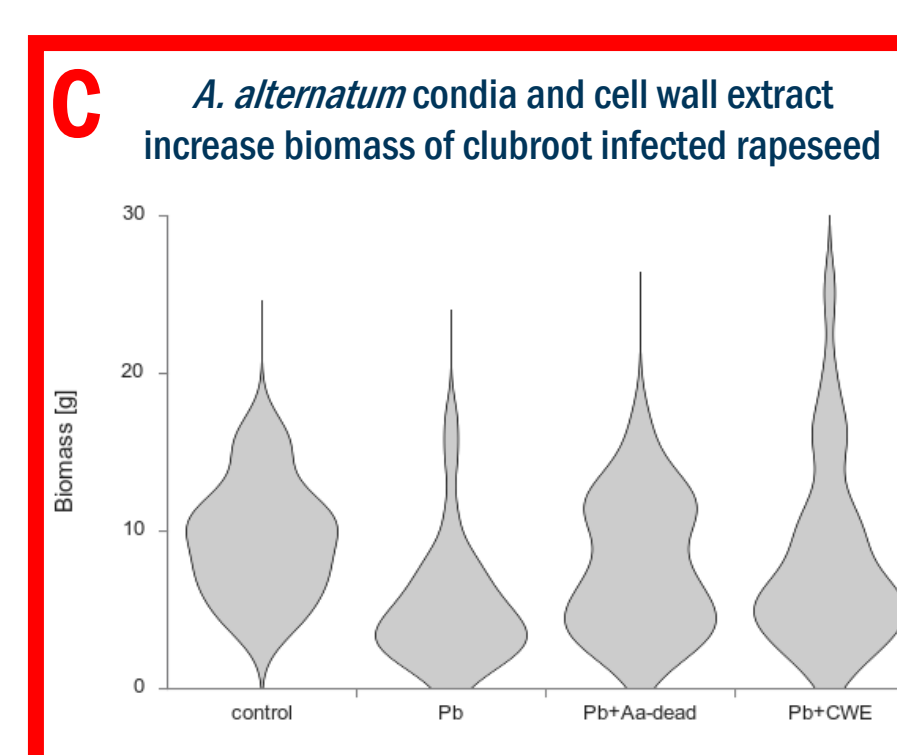
### Abiotic stress with NaCl salt

- A. alternatum* increased biomass of Arabidopsis grown on NaCl containing substrate by 740 % (agar, 75 mM → see **A**) and 20% (soil, 100 mM)
- Rosette diameter of plants was increased by 20 %



### Biotic stress with leaf pathogen *Botrytis cinerea*

- A. alternatum* reduced lesion size on Arabidopsis leaves by 70 % (spray) and 50 % (soil application → see **B**)
- A. alternatum* conidia were applied either as soil drench or directly sprayed on leaves prior to infection with *Botrytis*



### Biotic stress with (club)root pathogen *Plasmodiophora brassicae*

- Autoclaved conidia and a crude cell wall extract (CWE) from *A. alternatum* reduced disease symptoms of clubroot in rapeseed by 30 % and delayed pathogen development<sup>4,5</sup>
- Treatments increased plant biomass by 50 % (→ see **C**)
- Resistance genes were upregulated in root tissues

## Conclusions

- A. alternatum* reduced stress in host plants as evidenced by higher biomass and survival rates and less severe symptoms
- Biocontrol effect might be a result of induced resistance  
→ resistance marker genes were upregulated

## Outlook

- Specify molecular markers crucial for biocontrol effect
- Find cooperation partners for field-trial like experiments with the fungus *A. alternatum* to verify greenhouse trials
- If you are interested in collaboration → please contact me!

### Additional information for materials and tools used:

- For pathogen assays *Plasmodiophora brassicae* single spore isolate e3 and *Acremonium alternatum* CBS407.66 were used
- All experiments were conducted in climate chambers (Sanyo MLR 351) at long day conditions (16 h light at 23 °C, 8 h dark at 18 °C)
- Samples sizes per treatment were: Fig. A: n=100 plants on agar, n=20 on soil (see text); Fig. B: n=36 leaves from 9 plants on soil; Fig. C: n=30 plants on soil
- The Arabidopsis plant was drawn by hand from the author using Powerpoint
- All graphs were made with the dotplot tool available on [statistika.mfub.bg.ac.rs/interactive-dotplot](http://statistika.mfub.bg.ac.rs/interactive-dotplot)

### References:

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- Auer S, Ludwig-Müller J (2014). Effects of the endophyte *Acremonium alternatum* on oilseed rape (*Brassica napus*) development and clubroot progression. *Albanian Journal of Agricultural Science* 2014 (Special edition)
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