IPM 2.0
Towards future-proof crop protection in Europe

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Biological control of Verticillium wilt in cauliflower by the native endophyte *Verticillium tricorpus*.

Lien Tyvaert
Lab of Phytopathology, Ghent University

EFPP

Outline

- Verticillium wilt
- Field trial: presence of *V. tricorpus* negatively correlated with Verticillium wilt in cauliflower
- Effect of *V. tricorpus* on Verticillium wilt
- Future perspectives

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Verticillium wilt

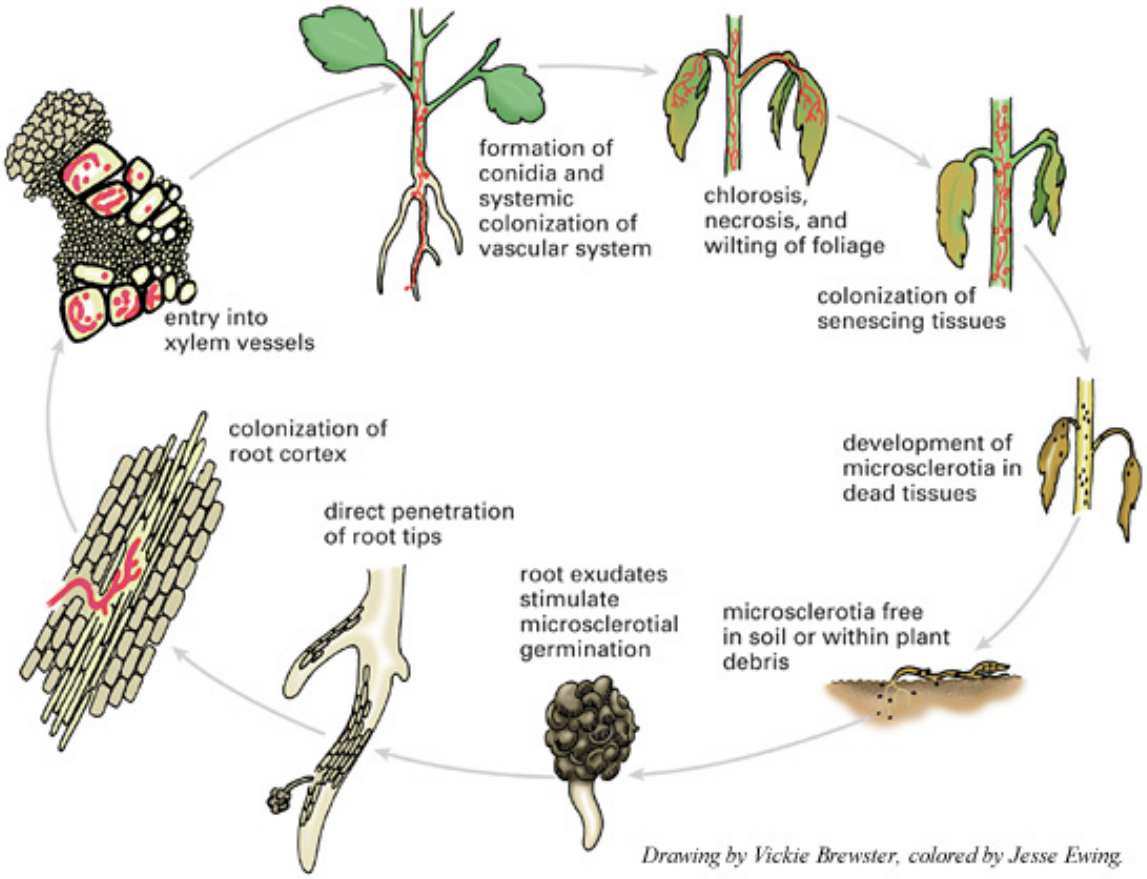
- General
  - Soil-borne pathogen
  - Broad host range
  - Vascular disease

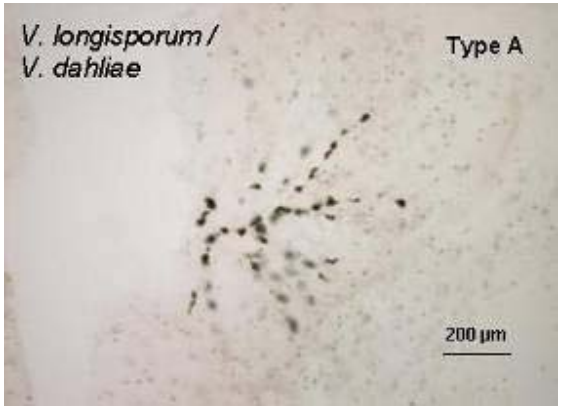
Verticillium wilt of cauliflower

- Causal agent: *V. longisporum*
- Symptoms:
  - Assymetric chlorosis of the leaves
  - Vascular discoloration
  - Defoliation
  - Stunting
  - Wilting

Verticillium wilt

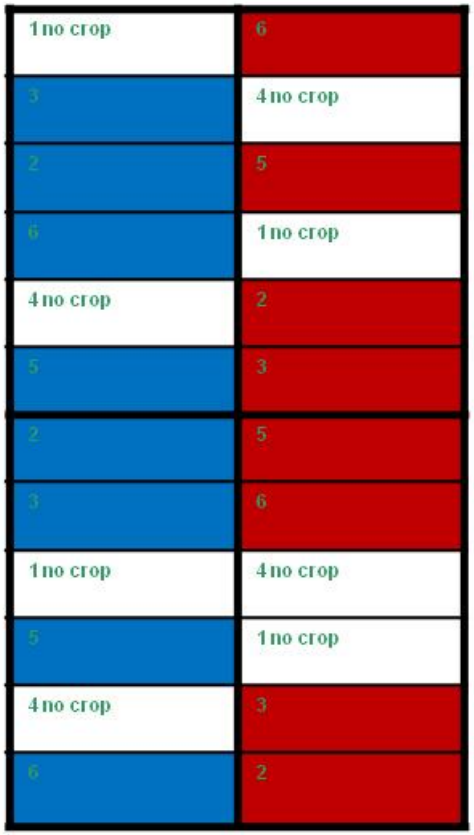
- Soilborne pathogen: production of microsclerotia

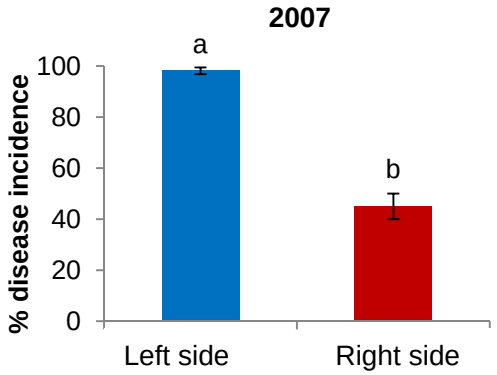


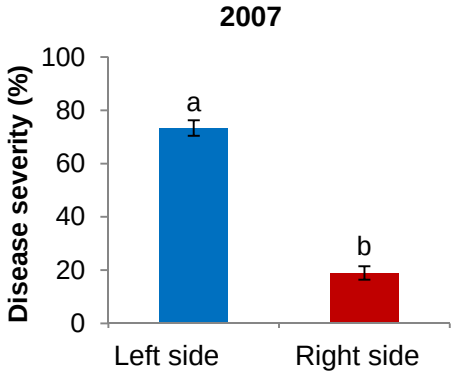


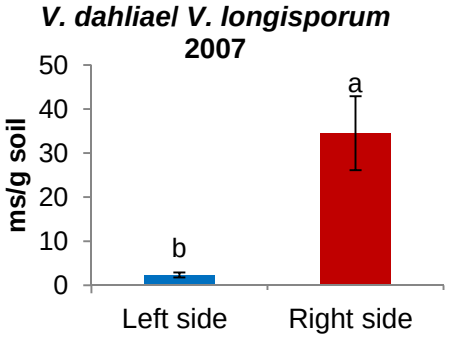
Field trial

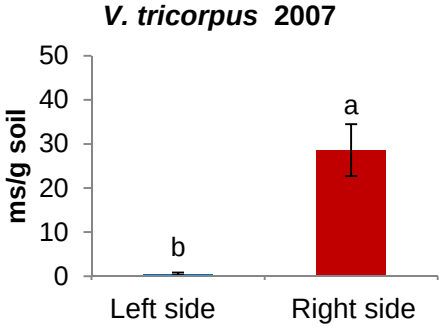
Spatial distribution of disease incidence in the field











Field trial

- History of the field over last 20 years:
  - Right side: 5 times potato in rotation with cauliflower
  - Left side: only cauliflower

- Negative correlation between *V. tricorpus* and Verticillium wilt
- Potato stimulates *V. tricorpus* and *V. longisporum*/*V. dahliae*

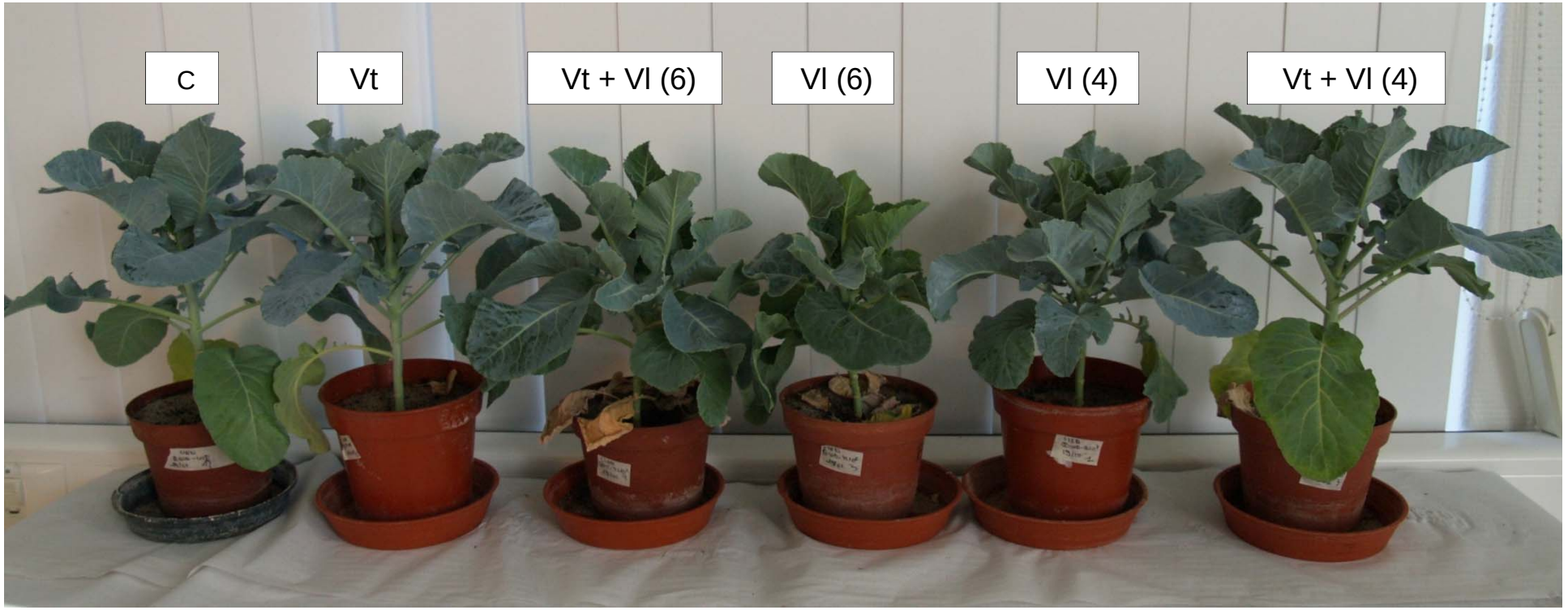
Effect of *V. tricorpus* on Verticillium wilt

❖Artificial inoculation

- Artificial inoculation of *V. tricorpus* and *V. longisporum* (2 concentrations)
- Symptom development (vascular discoloration, number of leaves, stem length, yellowing of leaves, wilting)
- Colonization by *V. tricorpus* and *V. longisporum* (qPCR)
- 4 time points (28 – 49 – 63 – 77 dpi; 4 repetitions)

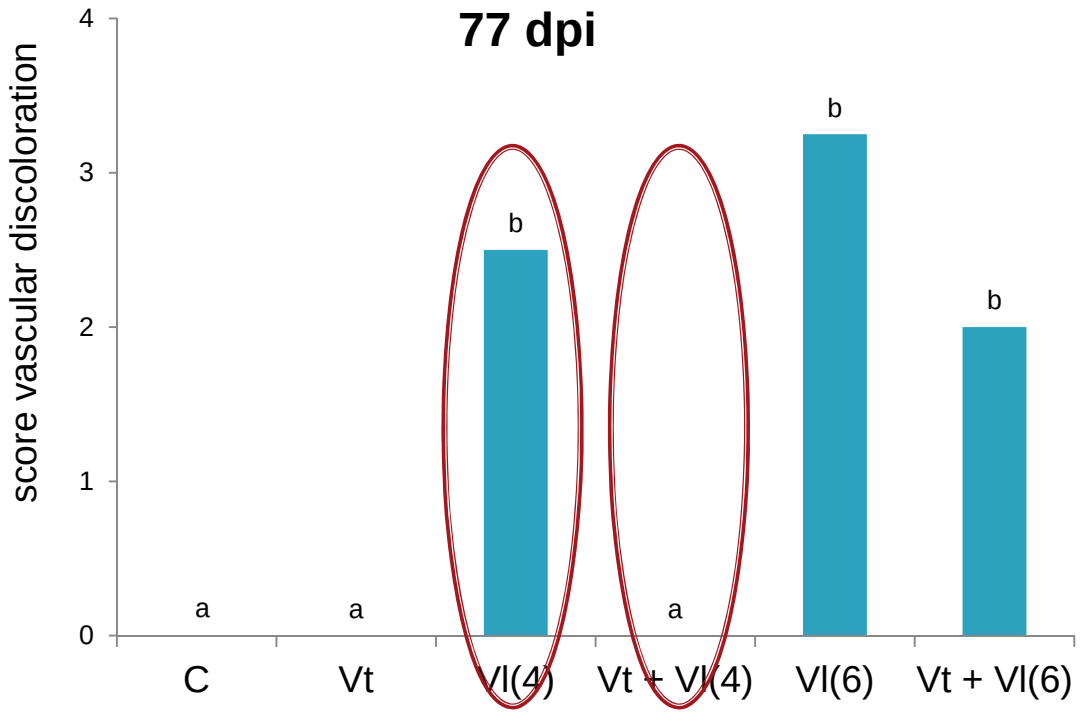
Effect of *V. tricorpus* on Verticillium wilt

- Symptom development

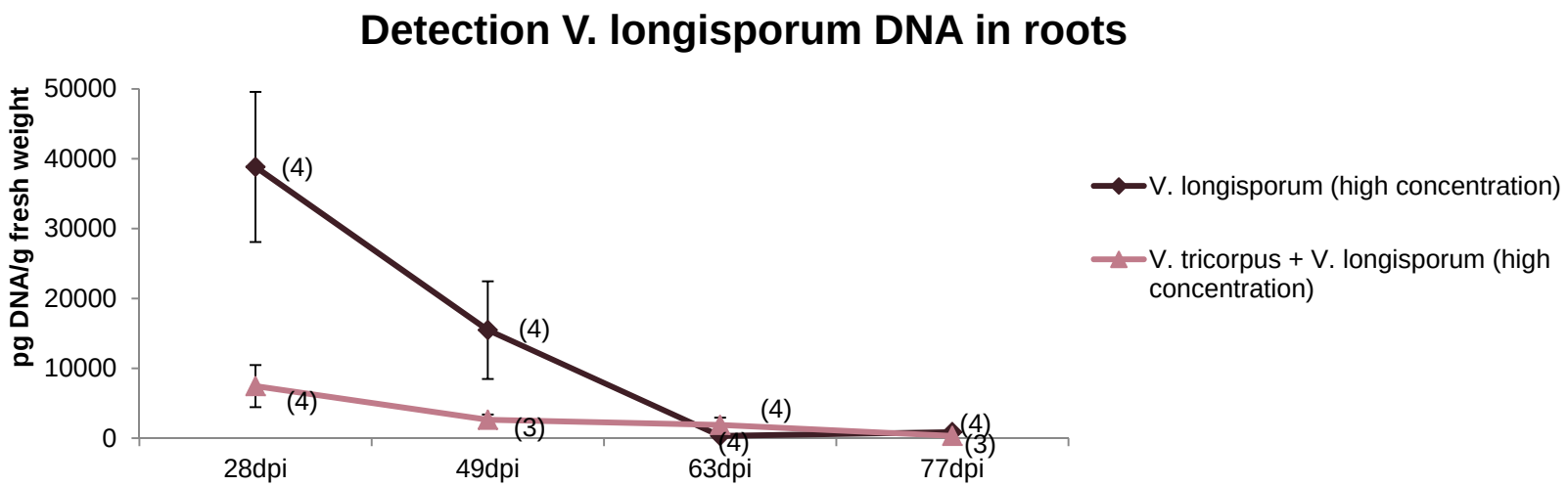


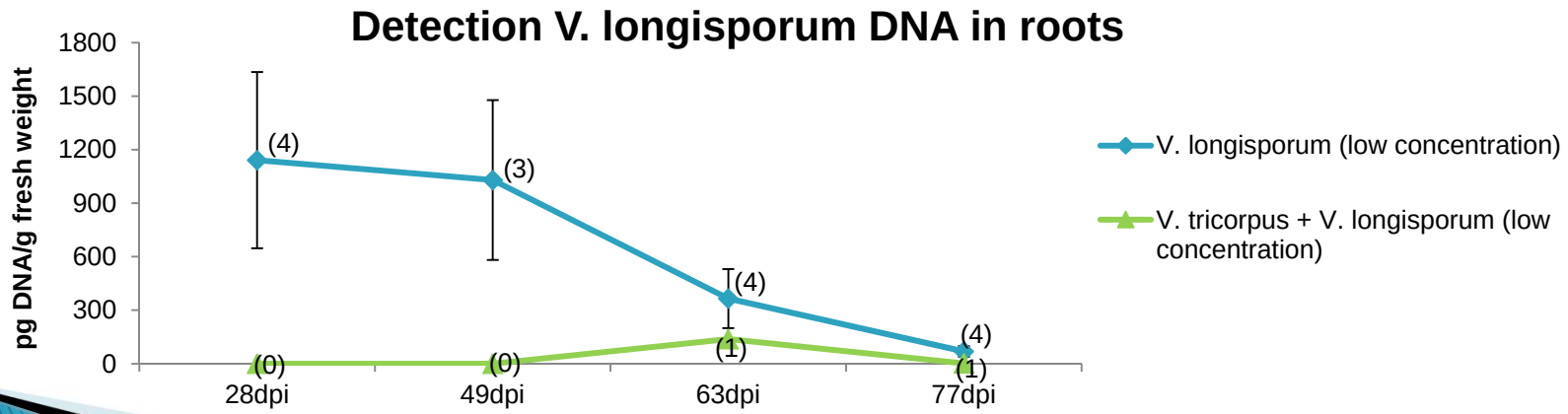
Effect of *V. tricorpus* on Verticillium wilt

- Symptom development: vascular discoloration

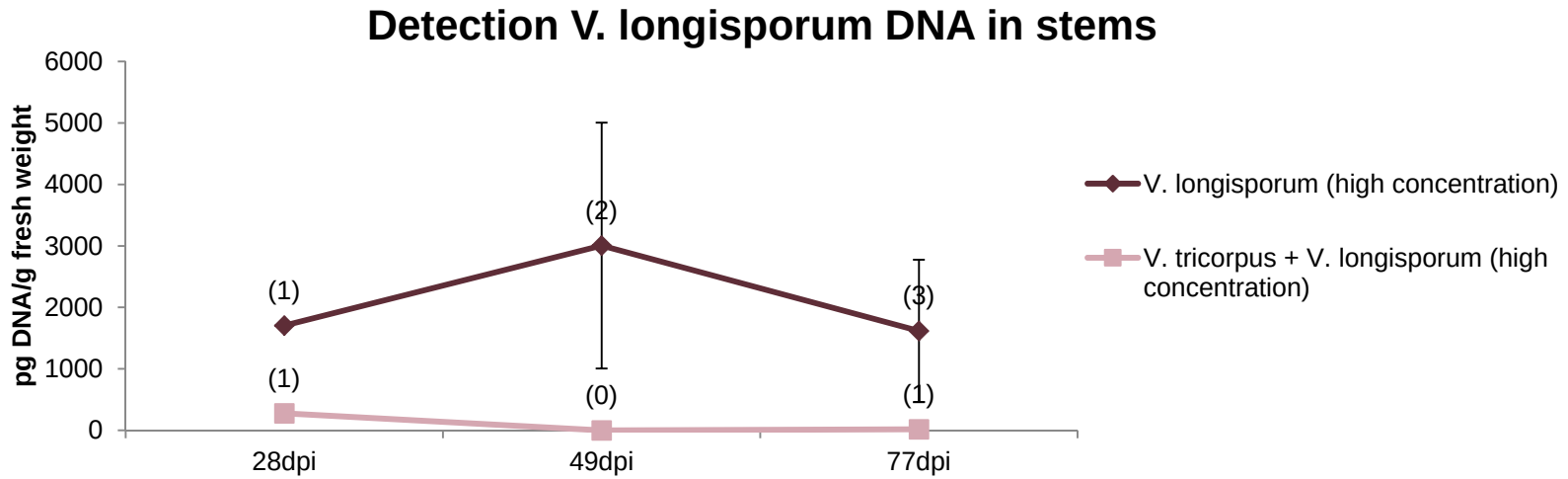


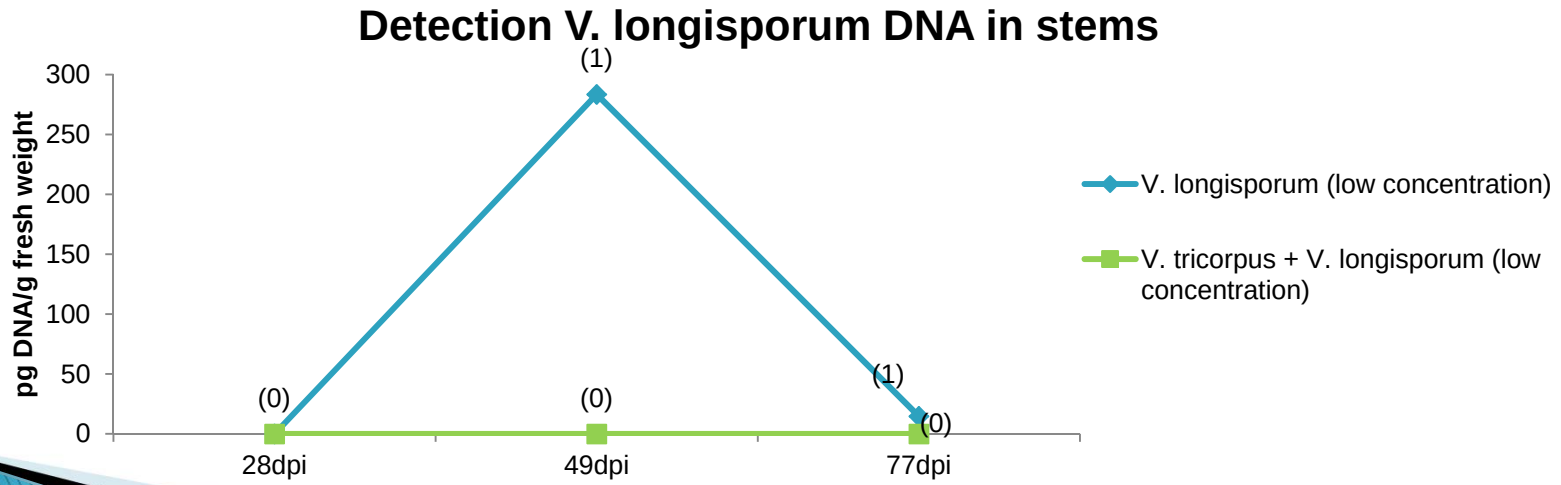
Effect of *V. tricorpus* on Verticillium wilt





Effect of *V. tricorpus* on Verticillium wilt





Effect of *V. tricorpus* on Verticillium wilt

- ✓*V. tricorpus* reduces disease incidence and vascular discoloration caused by *V. longisporum*
- ✓*V. tricorpus* reduces colonization by *V. longisporum*
- ✓*V. tricorpus* was detected in roots and stems

V. tricorpus is an endophyte and has potential as biocontrol agent

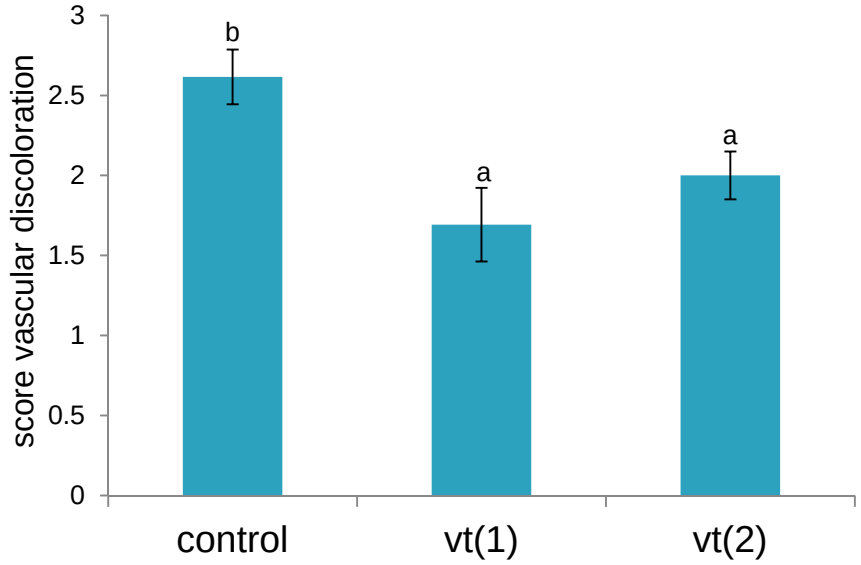
Effect of *V. tricorpus* on Verticillium wilt

❖Natural infestation

- Inoculation with 2 isolates of *V. tricorpus* (Vt) 1 week before transplantation
- Naturally infested soil from field with a history of Verticillium wilt
- Disease evaluation + qPCR

Effect of *V. tricorpus* on Verticillium wilt

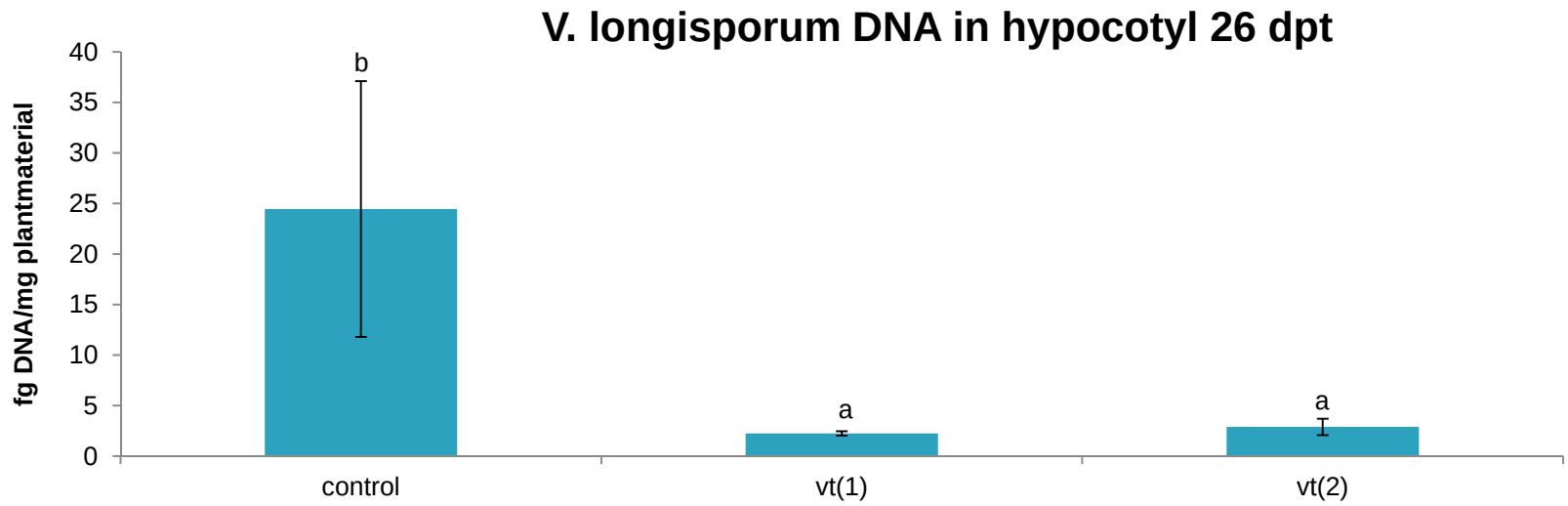
- Symptom development: vascular discoloration



- *V. tricorpus* reduces vascular discoloration

Effect of *V. tricorpus* on Verticillium wilt

- Colonization



- *V. tricorpus* reduces early colonization by *V. longisporum*

Future perspectives

- Production of *V. tricorpus* microsclerotia for inoculation of seedlings (mixed with substrate / phytodrip)
- Selection of host plants, stimulating the natural population of *V. tricorpus* in soil
- Mode of action
  - Competition (infection sites & nutrients)
  - Induced resistance (expression of genes)

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Thank you for your attention

- Questions?