Legume root-exuded phenolics inhibit development and phytotoxin biosynthesis in *Fusarium oxysporum* f. sp. *cubense* TR4

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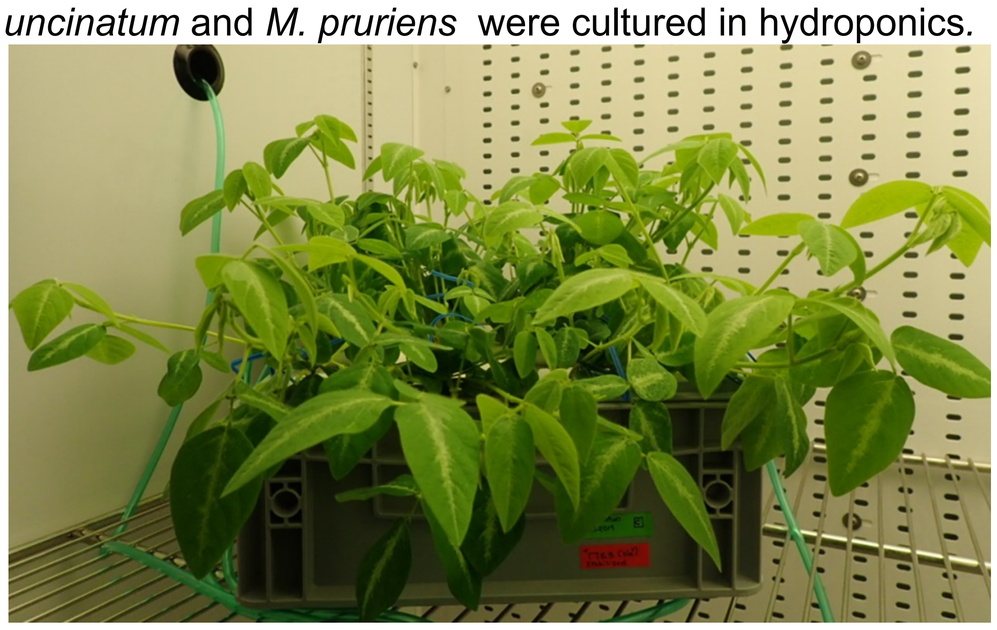
Background and Objective

- Nearly 400 million people globally depend on banana for food security and income.
- Banana is threatened by Fusarium wilt, a plant disease caused by *Fusarium oxysporum* f. sp. *cubense* (Foc).
- Foc Tropical Race 4 (Foc TR4) is the most destructive race of Foc that is particularly difficult to manage.
- Intercrops may suppress Fusarium wilt by releasing root exudates, but the mechanisms of suppression are poorly understood.
- **Objective:** To determine the composition of phenolic compounds in root exudates of legumes (*Desmodium uncinatum* and *Mucuna pruriens)*; assess the effect of phenolics on Foc TR4.

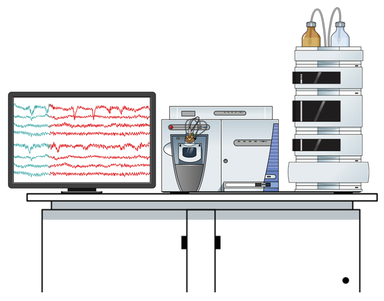
Methods

- *D. uncinatum* and *M. pruriens* were cultured in hydroponics.



- Root exudates were collected and analysed by HPLC-DAD.
- *In vitro* bioassays were performed on Foc TR4 using synthetic compounds (separately or mixed) to assess their effect on the most critical stages of pathogen development.

- Production of phytotoxins (fusaric acid, beauvericin) by Foc TR4 was analysed by HPLC-MS.



Results

- Phenolics (Benzoic acid, *t*-cinnamic acid, *p*-hydroxybenzoic acid) were the most abundant in root exudates of both legumes.
- All phenolics suppressed Foc TR4 by inhibiting spore germination, (**Fig. 1**), the production of new spores (**Fig. 2**), as well as the biosynthesis of fusaric acid phytotoxin (**Fig. 3**).

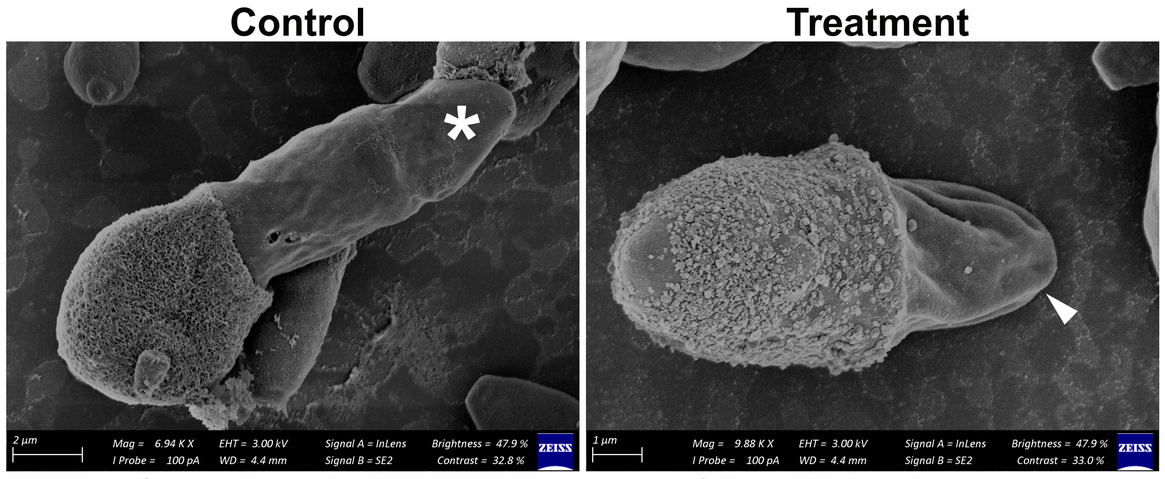


Fig. 1: Scanning electron micrographs of Foc TR4 chlamydospores showing inhibition of germination by a mixture of phenolic acids.

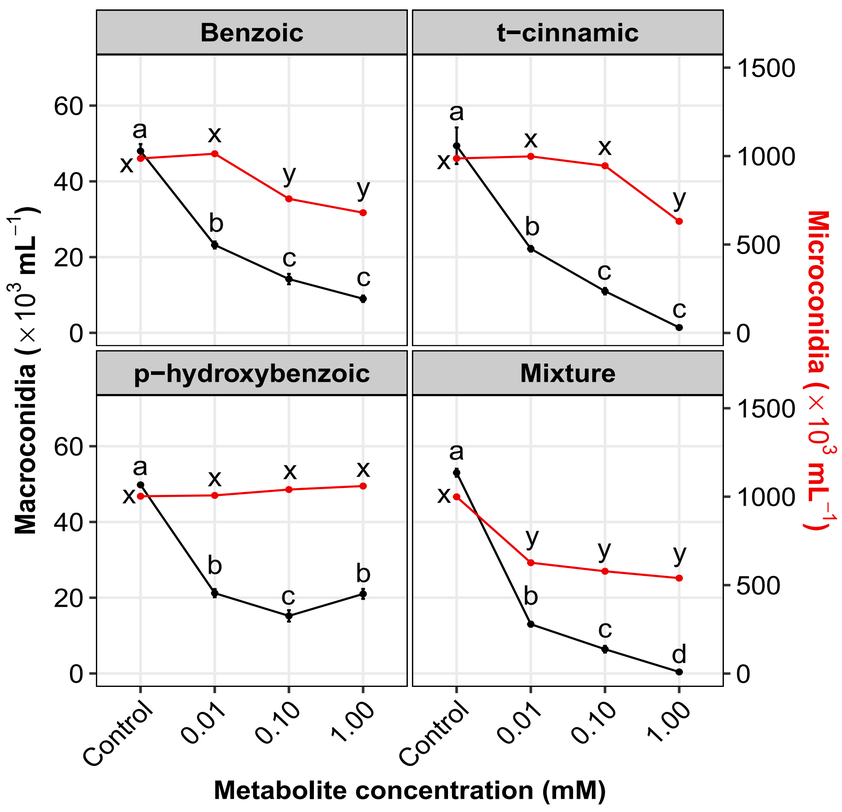


Fig. 2: Effect of phenolics on spore production in Foc TR4.

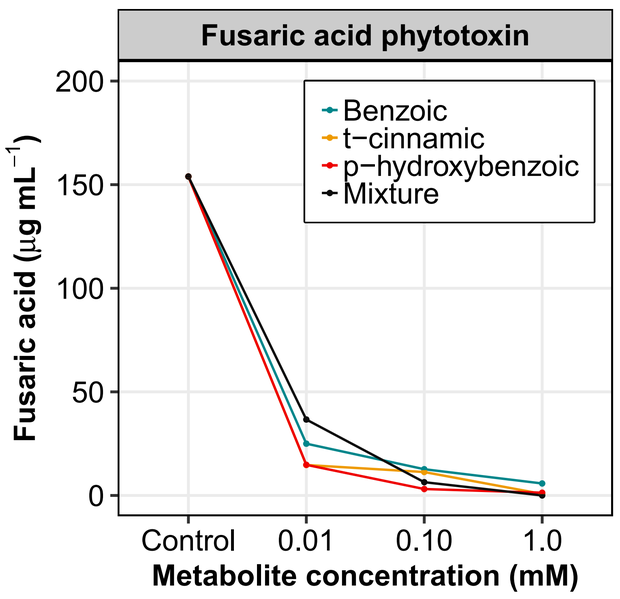


Fig. 3: Effect of phenolics on biosynthesis of fusaric acid phytotoxin.

Conclusion

Root exudates suppress Foc by various means. Phenolics directly inhibit the early stages of Foc TR4 development and phytotoxin biosynthesis.

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References

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