BACTERIAL ENDOPHYTES

HAVE THE POTENTIAL TO CONFER TOLERANCE TO TOBACCO BLACK SHANK AND RICE SHEATH BLIGHT

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Introduction

Approximately 600 bacterial endophytes isolated from various wild plants were screened in vitro against fungal plant pathogens *Rhizoctonia solani* and *Phytophthora nicotianae*. These two fungi cause highly destructive rice sheath blight and tobacco black shank, respectively. Endophyte-pathogen inhibition zones on Petri plates (Fig. 1A-1B) were rated and the best three endophytes against each pathogen were selected (Table 1) for further studies in the greenhouse.

Table 1 Antifungal endophytes and diseases investigated

Crop	Endophytes used	Diseases investigated
Rice	175; 294; 1551; and combination of 175/294/1551	Sheath Blight
Tobacco	389; 544; 1835; and combination of 389/544/1835	Black Shank

Experiment

Seedlings of rice cv. Katy and tobacco cv. 326 were soaked overnight in solutions of selected bacterial endophytes individually, and in combination (Table 1), and kept in the greenhouse for one week for bacterial colonization. Rice seedlings were inoculated with *R. solani* mycelial plugs; whereas, each tobacco pot was injected with 5 ml of *P. nicotianae* mycelial solution. The seedlings were bagged and kept in a humid chamber for four days at 75˚ C and moved to the greenhouse. Disease severity, incidence and vigor were recorded every week. Both experiments consisted of three replications per treatment with five plants per replication.

Fig. 1 **A & B**: Antifungal activity of endophytes 1835 and 175 against *P. nicotianae* and *R. solani*, respectively; **C**: Inoculating tobacco seedlings with endophyte 1835; **D & E**: Tobacco and Rice seedlings kept under humid conditions after being exposed to pathogens.

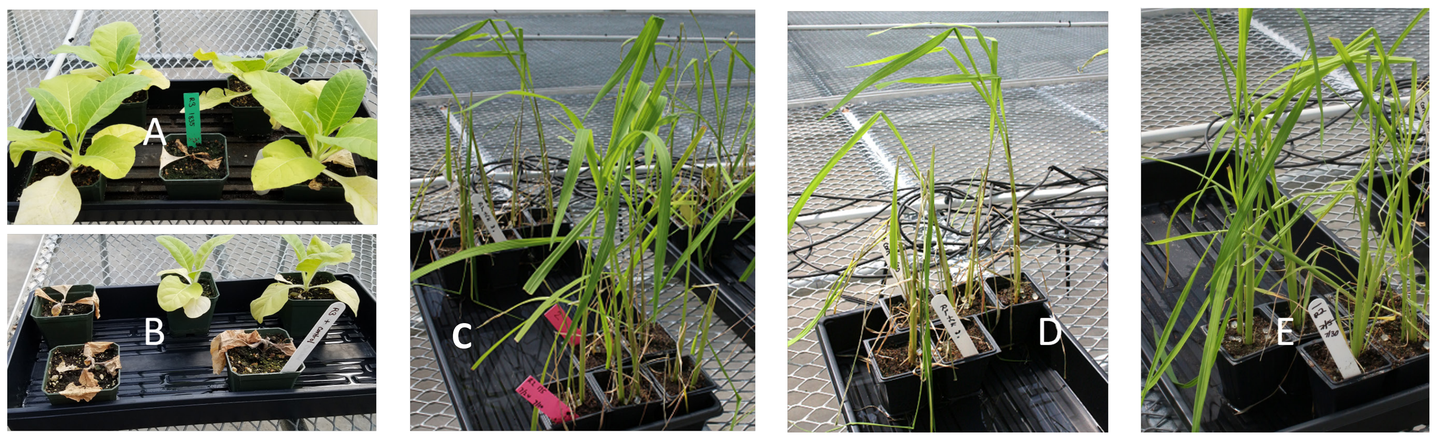
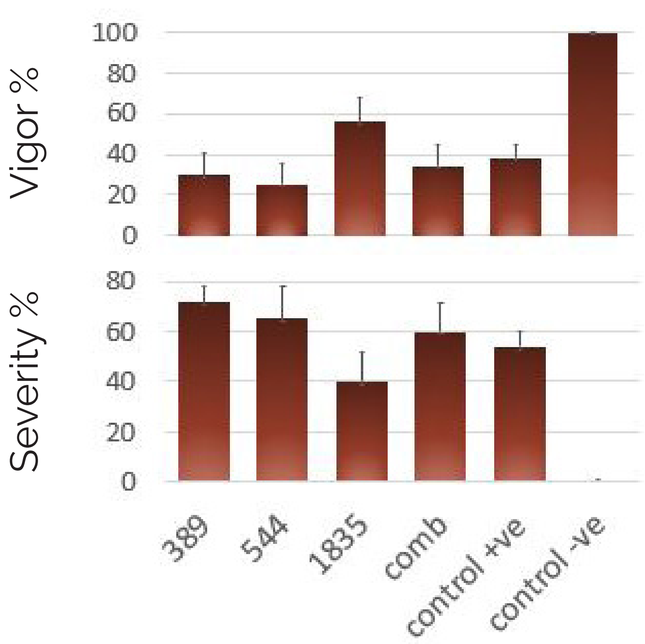


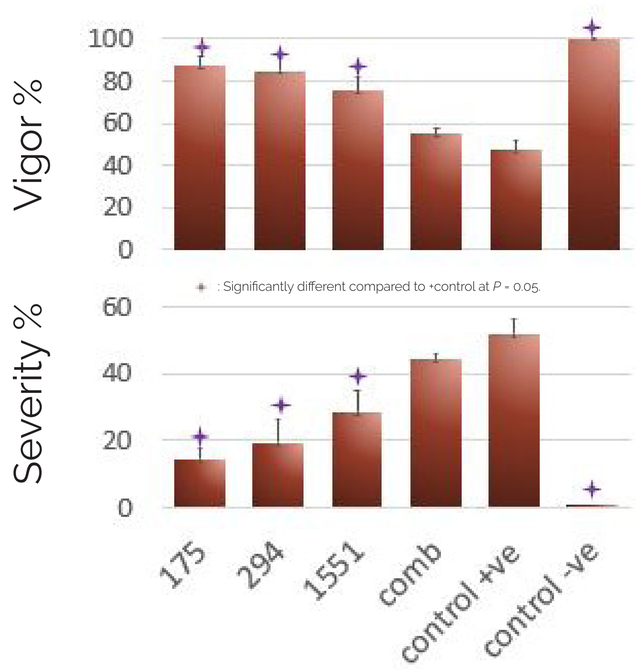
Fig. 2 **A-D**: Endophyte-inoculated and non-inoculated tobacco and rice plants exposed to black shank and sheath blight pathogens; **E**: Rice plants with no exposure to pathogen or endophytes.

Results

A: Tobacco seedling vigor and black shank severity four weeks after inoculation



B: Rice seedling vigor and sheath blight severity two weeks after inoculation



- All seedlings of inoculated **rice** showed disease symptoms by the end of 1st wk (Fig. 2C).
- **Tobacco** plant disease incidence varied between 40%-72% with lowest for 1835 and highest for 389 treated plants, respectively.
- Though statistically not significant **tobacco seedlings** colonized with endophyte 1835 showed higher vigor and lower disease severity compared to +ve control (Graph A).
- **Rice seedlings** showed higher vigor and lower severity for all endophyte treatments except for the combination when compared to +ve control (Graph B, Fig 2C).

Conclusions

- Bacterial endophytes seem to aid rice seedling's toleration of sheath blight.
- Endophyte 1835's potential to confer tolerance to tobacco black shank needed to be tested again.

References
Santhanam, R. et al. Native root-associated bacteria rescue a plant from a sudden-wilt disease that emerged during continuous cropping. Proc. Natl Acad. Sci. USA 112, E5013–E5020 (2015)
Mei, C. & Flinn, B. S. The use of beneficial microbial endophytes for plant biomass and stress tolerance improvement. Recent Pat. Biotechnol. 4, 81–95 (2010)