Collaborative Study on Black Shank Sub-Group Report

Coordinator: Wei Ding

2022 CORESTA Congres Online

October 2022

THE BACKGROUND

- **Black shank, caused by the Oomycete *Phytophthora parasitica* var. *nicotianae*, is a widespread and destructive disease of tobacco (*Nicotiana tabacum*).**
- **Black shank affects all types of cultivated tobacco worldwide with losses in individual fields.**
- **The rapid emergence of new races in field conditions.**
- **The misdiagnosed black shank (…eg with Fusarium wilt).**
- **The limitation of newer resistant varieties available.**

THE BACKGROUND

- A Black Shank Sub-Group was constituted in Coresta to conduct a global collaborative study since 2015;

However, new developments since then-;

- Changes in the pathogen race composition in some areas;
- Molecular approaches for impoving disease resistance to Black Shank.

Collaborative Study on Black Shank

OBJECTIVES

- To establish the range and race composition of *Phytophthora nicotianae* in different locations;
- To investigate the cause of misdiagnosed black shank (… eg with Fusarium wilt);
- Establish the relative resistances of the varieties in the different locations;
- To evaluate the molecular mechanism of black shank resistant varieties (plant-pathogen interaction).

Collaborative Study on Black Shank

PROPOSED MATERIALS & METHODS

Tobacco types

- ❖ Known susceptible checks and race 0 & race 1 resistant checks
- ❖ Resistant test lines

Locations

- ❖ Proposal-trials in Northern & Southern hemispheres

Looking forward for more known resistant tobacco types

Collaborative Study on Black Shank

Misdiagnosed black shank

- Symptoms and LAMP

Molecular mechanism of black shank resistant varieties

- Evaluate the different of black shank resistant varieties;
- Oomycete RXLR effectors;
- Screening and identification of plant resistance proteins targeted by *Phytophthora* RXLR effectors.

Collaborative Study on Black Shank

Experimental design

- More known resistant and susceptible lines for check
- Pot experiment (smaller plots, more reps);
- Long-time field experiment for resistant checks;
- Core effectors used for screening of plant resistant proteins

Centre de Coopération pour les Recherches Scientifiques Relatives au Tabac
Cooperation Centre for Scientific Research Relative to Tobacco

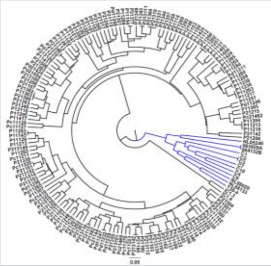
Achievement study on Black Shank

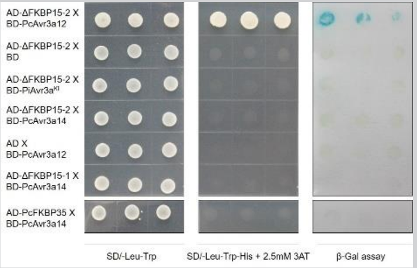
Molecular approaches for impoving disease resistance to Black Shank.

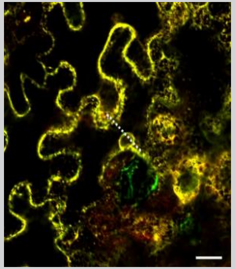
- Roles of effectors in plant-Phytophthora interaction
- Genetic dissection of plant susceptibility to pathogen infection
- Effector targets as novel source of disease resistance

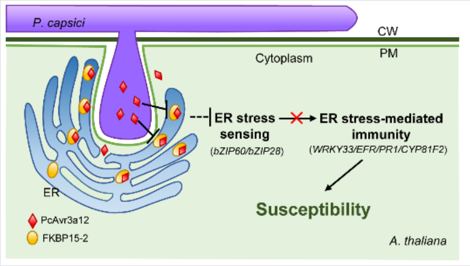
Prof. Weixing Shan

Northwest A&F University









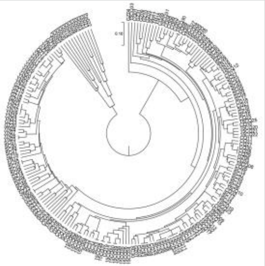
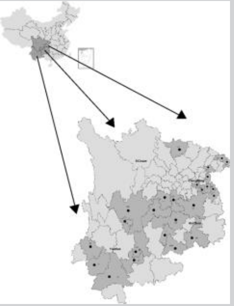
Wang et al., 2012
Yin et al., 2017
Fan et al., 2018
Zhang et al., 2019
Li et al., 2019
Zhang et al., 2020
Yang et al., 2022

Achievement study on Black Shank

Genetic diversity of *Phytophthora parasiticus* in Southwest China

- **The genetic diversity is high**
- **Population variation**



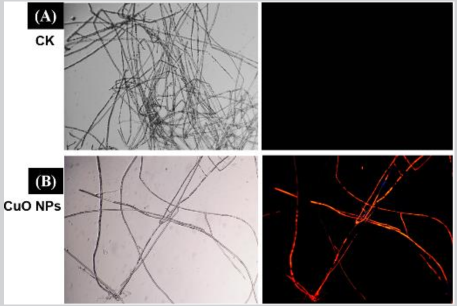




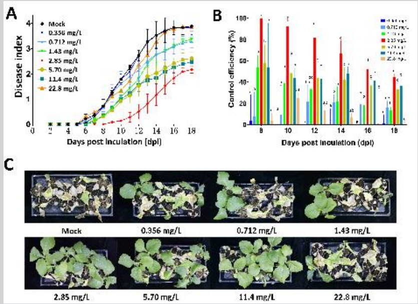
Achievement study on Black Shank

Bio-control strategies for black shank

- ❖ **Novel plant defense elicitors (control efficacy 57.8%)**
- ❖ **Nanoparticles (MgONPs / ZnONPs / CuONPs, control efficacy 50.4%~55.6%)**

PhD. Liang Yang, Southwest University





CK **Treatment**

Chen et al., 2017
Cai et al., 2018
Chen et al., 2020
Yao et al., 2021
Yang et al., 2022

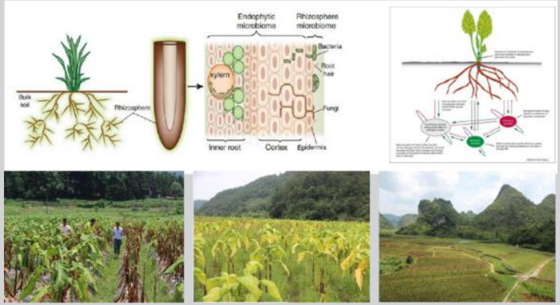
Achievement study on Black Shank

Guideline for the bio-control of tobacco black shank

- Balance of soil pH
- Balance of soil mineral nutrition
- Balance of soil micro ecology
- Balance of cultivar resistance and pathogen virulence

Prof. Wei Ding

Southwest University



Yang et al., 2016
Li et al., 2016
Liu et al., 2017
Yang et al., 2017
Chen et al., 2018
Chen et al., 2020
Yang et al., 2021
Yao et al., 2021

Achievement study on Black Shank

Promotion of green ecological control of tobacco soil-born diseases

- Chongqing province, China (control efficacy 76.8%)
- Guizhou province, China (control efficacy 73.2%)
- Sichuan province, China (control efficacy 79.5%)
- Henan province, China (control efficacy 82.4%)

Collaborative Study on Black Shank QUESTIONS TO THE FLOOR...

- Looking forward for more participants who would like to take part in the study?
- Are there lines you think can be included?
- Any suggestions for a potential coordinator?

CONTACT US

- Wei Ding - dwing818@163.com
- Liang Yang- liangyang@swu.edu.cn

THANK YOU