

ViAE: Improving livelihoods in Vietnam through agro-ecological innovations for sustainable banana Fusarium disease management in family farming

Thi Thao Mi VU^{1,2}, Dang Toan VU², Sébastien MASSART¹

1. University of Liege/Gembloux Agro-Bio Tech, Gembloux, Passage des Déportés 2, 5030 – 2. Plant Resource Center – Vietnam Academy of Agriculture Science

Problem: a devastating emerging disease of banana

Panama disease (or Fusarium wilt), caused by the soil-borne fungus *Fusarium oxysporum* f. sp. *cubense* (Foc), has a long history of damaging banana production. Around 1962, the Cavendish cultivar was found to resist the existing strains of Fusarium wilt and replaced Gros Michel in the export market (Ploetz, 2015). However, a new strain, Foc Tropical Race 4 (Foc TR4), has emerged as a significant threat to Cavendish bananas in tropical regions (Ghag et al., 2015).

In Vietnam, Foc TR4 was first reported in 2017, affecting Cavendish bananas in the northern provinces (Hung et al., 2018). Now, it has become the most dangerous disease on banana in Vietnam (figure 1.a). This has raised concerns about the future of banana production in the country and the livelihoods of farmers who depend on this crop.



Figure 1: A banana field damaged by Foc TR4 in Vietnam and Fusarium wilt (FW) symptom (a:empty patches in fields where plants have died because of Foc TR4; And symptom with b: Yellow leaves; c: reddish-brown discoloration in the plant's vascular system (xylem); d: symptom red-brown discoloration on leaf stalks)

Solution: ViAE: an interdisciplinary project

Three PhD candidates would work on Foc TR4 in three different ways under the project (Figure 2).

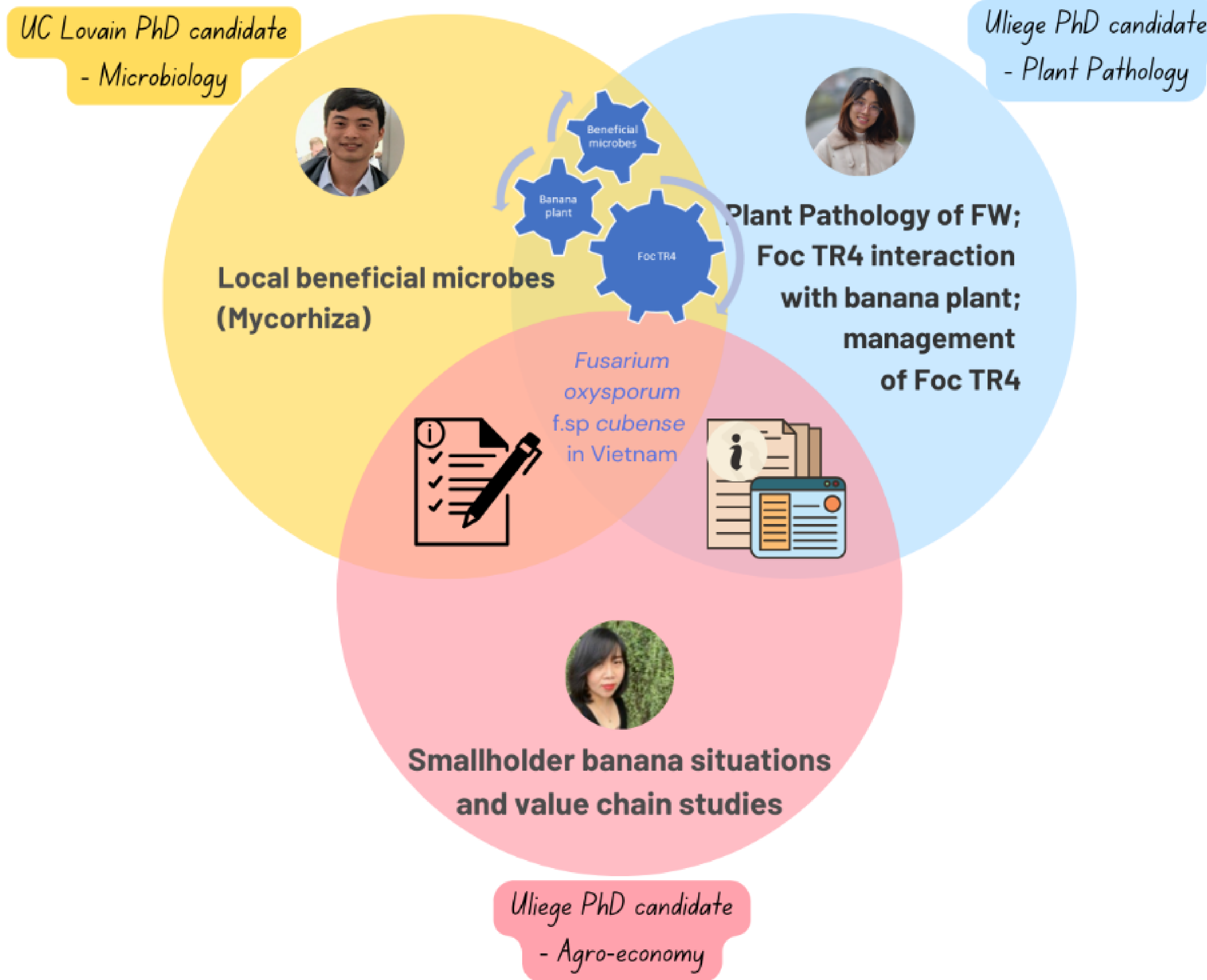


Figure 2: 3 PhD candidates under ViAE project

Ongoing research

Survey

In 2024, a survey was taken from 5 communes in the north of Vietnam (Figure 3). In each field, the survey included interviews with farmers, symptom observation, and sampling.



Figure 3: Survey locations for five different fields

The interview was made in person with 2 main objectives: basic information about the field, farmer and farming technique, and the farmer's perception of Fusarium wilt on banana.

The symptom of Foc TR4 in banana plantations was recorded and samples were taken for further analyses in the laboratory (Figure 1: b,c,d).

Farmers' interview

The collected information related to the field, farmer, and farming technique was collected to identify if agroecological practices can help alleviate the disease and detect them within growers.

The list of question decision (Figure 4) showed the results to evaluate farmers about knowledge for Fusarium wilt on banana and relevant.

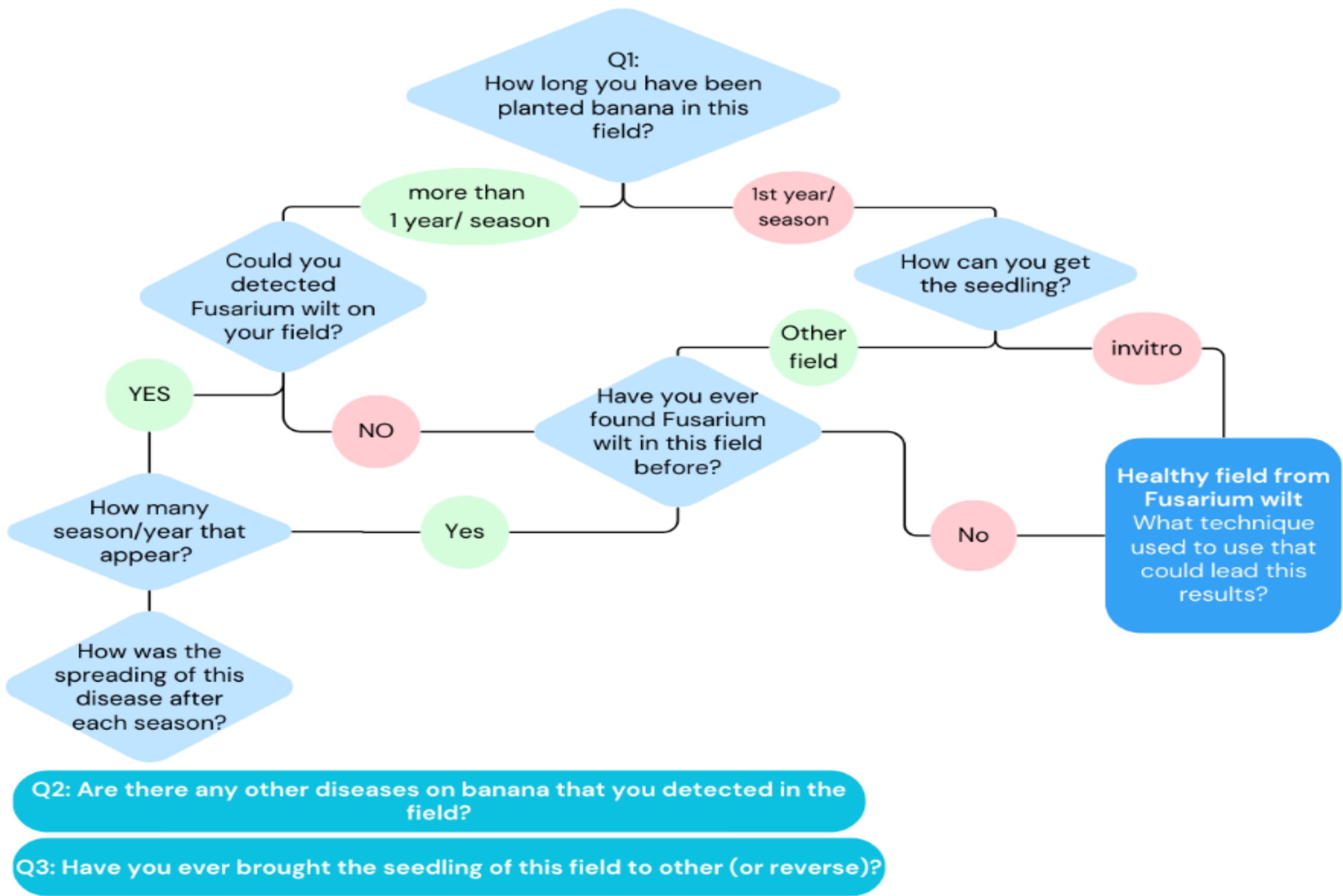


Figure 4: Questions related to growers' perception about Fusarium wilt on banana.

Analysing the endophytic microbial communities

Samples taken from five Vietnamese fields (figure 3) would be analysed using high-throughput sequencing in order to examine the microbiome composition of healthy sucker from both healthy and Foc TR4-infected bananas. The purpose of this research is to find variations in the microbial communities of diseased and healthy plants, which may provide information about the susceptibility or resistance to disease.

Development of a pathogenicity test

An in vitro pathogenicity test of FOC on banana is currently under development. It will allow to make rapid screening for resistance in the laboratory before a scale up in field conditions.

Testing beneficial microbes

Banana plants not only harbour diseases but also a variety of helpful microbes that aid in growth. Studying these microorganisms may provide insightful information and possible approaches to disease control. Although stress has a detrimental effect on the plant, beneficial microorganisms that promote plant growth may be able to regulate plant growth and lessen the effects of Foc TR4.

Expected outcome

Through solutions from all 3 PhD candidates under ViAE project for sustainable management of banana Fusarium disease, we want to enhance livelihoods in Vietnam.

Reference

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