

## Introduction

- Crapemyrtle bark scale (CMBS), an invasive and polyphagous sap-sucking hemipteran, has spread across 14 states.
- The infestation of CMBS negatively impacts ornamental plants' flowering and even some crops' fruiting.
- The CMBS host identification is critical to determine potential risks to ecosystems and industries and helps develop strategic management. However, conventional methods to confirm hosts are time and resource-consuming.
- The electrical penetration graph (EPG) monitoring system can track CMBS' stylet penetration in real-time, providing essential information on the interaction mechanism.
- Establishing a fast and reliable approach can help confirm potential hosts more efficiently.

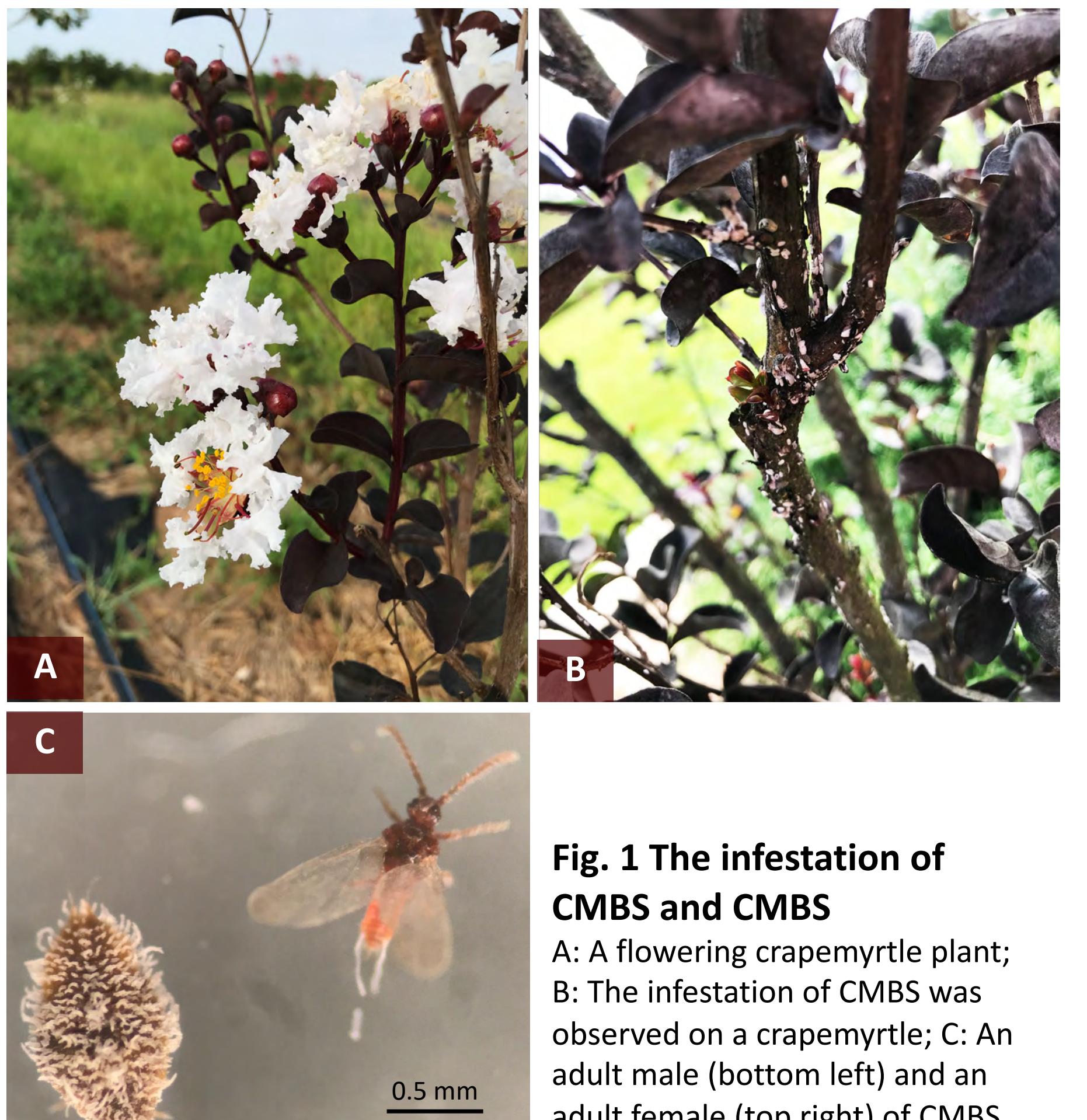


Fig. 1 The infestation of CMBS and CMBS

A: A flowering crapemyrtle plant; B: The infestation of CMBS was observed on a crapemyrtle; C: An adult male (bottom left) and an adult female (top right) of CMBS.

# EPG application in feeding behavior study helps rapidly confirm potential hosts of crapemyrtle bark scale (*Acanthococcus lagerstroemiae*)



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## Methods and Materials

### 1. Establishment of EPG monitoring system

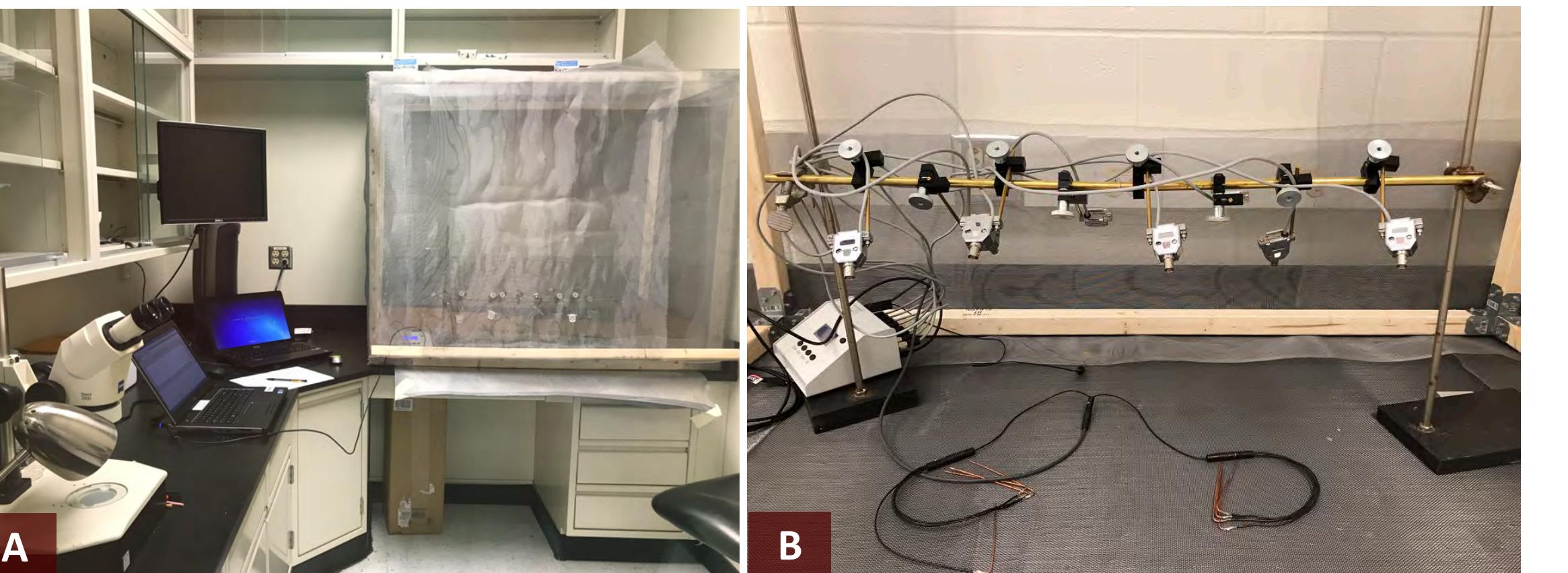


Fig. 2 Set up the EPG monitoring system

A: The EPG monitoring system consists of a Faraday cage, EPG monitoring devices, two laptops, a ZEISS Stereo microscope, a suction system, a heater, and a Watchdog temperature monitor; B: The EPG devices contain EPG probes, plant/soil electrodes, and Giga-8dd control unit.

### 2. Monitoring feeding behavior of CMBS on different plant species.

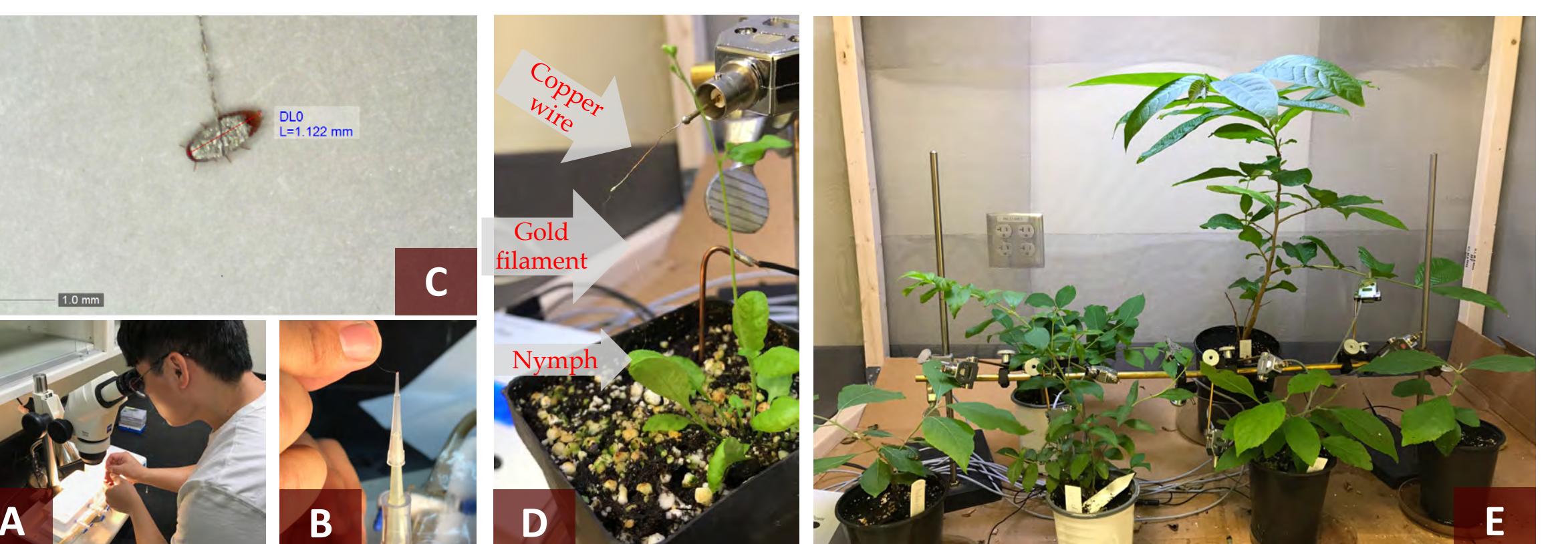


Fig. 3 Basic steps of monitoring feeding behavior of CMBS

A: Put the suction device under the dissecting microscope; B: For easy access to its dorsum, mounted the CMBS nymph on its ventral side towards the suction tip, under help of a ZEISS Stereo microscope; C: Attached the nymph to a gold filament using a water-based glue; D: Inserted the gold filament attaching with a copper wire into an electrode connecting with an amplifier; Another electrode was put into the pot substrate; E: Feeding behavior of CMBS was monitored on different plant species.

- To confirm a host or non-host through the EPG system, *Buxus microphylla* var. *japonica* 'Gregem', *Callicarpa acuminata*, *Ficus pumila*, *F. tikoua*, *Lagerstroemia limii*, *L. speciosa*, and *Malus domestica* 'Red Delicious' were utilized in this study.
- 11 effective sets of 24h recordings about feeding behavior on *L. limii* were analyzed to characterize the waveforms.

## Results and Discussion

### 1. Typical waveforms were recorded when CMBS feeding on host plants.

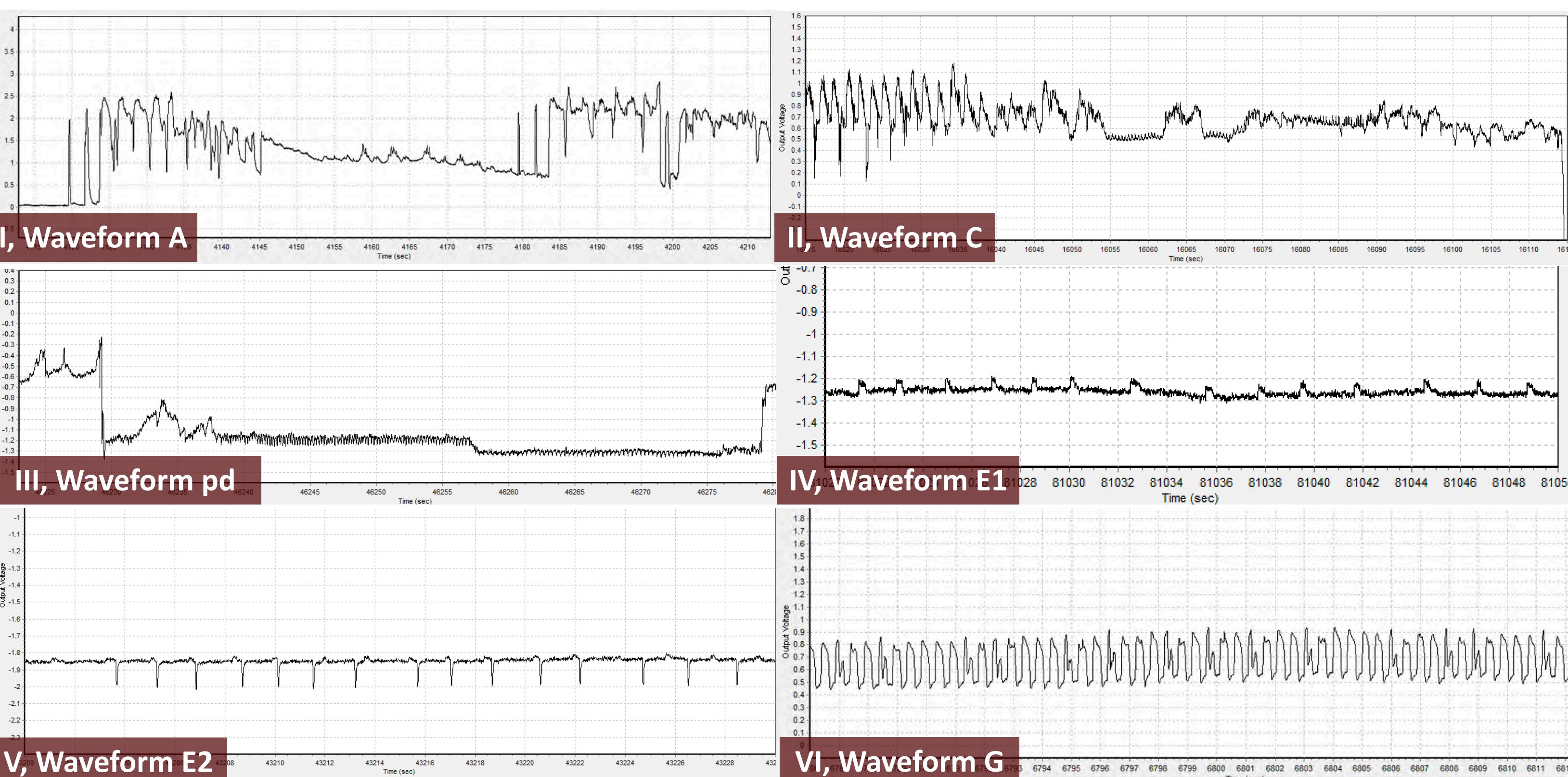


Fig. 4 Typical waveforms were generated and characterized when CMBS feeding on the host plants

I: Waveform A was firstly detected when CMBS's mouthpart contacted the surface of the plant; II: Waveform C was generated when extracellular punctures occurred; III: Waveform potential drop, containing pd1 and pd2, was observed indicating CMBS' stylet puncture activities; IV: Waveform E1 was shown when intracellular stylet activity in mesophyll and phloem sap ingestion occurred; V: E2, another sub-pattern of waveform E, was characterized by negative peaks; VI: Waveform G was recognized when CMBS was ingesting in xylem.

### 2. Feeding activities of CMBS varied on susceptibility-different plants.

- **Hosts:** All waveforms were detected on *C. longissima*, *F. tikoua*, *L. limii*, and *L. speciosa*. This result verified these species as the hosts for CMBS.
- **Alternative hosts:** Except for waveform E, all other waveforms were detected on *C. acuminata*, *F. pumila*, and *M. domestica* 'Red Delicious', demonstrating that CMBS took xylem sap but did not drink from phloem tissue. Thus, *Callicarpa acuminata*, *F. pumila*, and *M. domestica* 'Red Delicious' have the potential of being the hosts.
- **Non-hosts:** No feeding activity has been detected on this boxwood 'Gregem' yet, suggesting that this *Buxus* might not be the potential host.

## Future Directions

- Apply the EPG method to confirming more economically important crops and native plants.
- Investigate effects of insecticides on feeding activities of CMBS, providing info on CMBS control.