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BOOK OF ABSTRACTS

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Vibrational mating disruption of glassy-winged sharpshooter *Homalodisca vitripennis*, vector of *Xylella fastidiosa* in California

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Highlights
- The mating behavior and associated communication of glass-winged sharpshooter (GWSS) has been described in detail
- GWSS significantly reduced mating when subjected to different playback signals in lab and field
- A new disruptive signal has been created with characteristics specifically designed to disrupt the GWSS

Introduction

The glass-winged sharpshooter (GWSS) is a grapevine pest in California where it represents a serious threat to viticulture due to its ability to transmit *Xylella fastidiosa* that causes Pierce's disease in grapevines (Davis et al., 1978). GWSS reproduces from spring to fall producing at least two generations per year. The objectives of this study were to identify and characterise GWSS vibrational signals and test whether the emission of putative disruptive playback signals could reduce the mating success of the species. Vibrational mating disruption is an innovative method that was successfully applied in laboratory and semi-field conditions to prevent mating in the grapevine leafhopper *Scaphoideus titanus* (Eriksson et al., 2012). Therefore, our aim was to assess whether the same technique could also be applied to disrupt the GWSS mating behaviour.

Material and methods

GWSS was reared on several host plants (*i.e.* okra and sunflower) starting from eggs collected in Bakersfield, CA during springs 2015 and 2016. Nymphs were separated by sex as late instar stages (fourth to fifth) to ensure a virgin status in the adult stage. To describe the mating behaviour (test A), single individuals (either males or females) and pairs were isolated on potted okra plants included in a Plexiglas box and recorded with laser vibrometer (PDV 500, Polytec) for up to 1 hr. Three types of trials were performed using (1) individual, (2) one male and one female, or (3) one female and two males. To test the possibility to disrupt the pair formation process (test B), three types of playback signals were used along with no playback (silence) as the control: white noise, natural female calls, and female noise. Playback signals were emitted through a minishaker (mod. 4810, Bruel and Kjaer). In addition, to disrupt the male calling behaviour (test C), we synthesised and used as playback two other signals with pure frequency band at 80 Hz or 240 Hz and a third signal with frequency bands at 80 and 240 Hz. 80 Hz was chosen because it was the value of the female song fundamental and dominant frequency; 240 Hz was randomly chosen to represent another harmonic. In this case, single males were stimulated with playback of female calling signal, emitted by one minishaker while a second minishaker transmitted the disruptive frequencies.

Results and discussion

Behavioural analysis showed that GWSS mating communication involved the emission of three male and two female signals, with specific roles in two different phases of mating behaviour, identification and courtship. Females call first and then a vibrational duet between genders is established, which can be temporarily interrupted in the presence of male rivalry. Male rivalry behaviour involved the emission of three distinct rivalry signals. Two rivalry signals mimic female signals and were associated with replacement of the female in the duet by the rival male. The third rivalry signal was emitted by side competing males. Playback of white noise, pre-recorded female signals, or artificial female noise significantly reduced mating of GWSS when compared to silent control mating trials. In response to playback of female signals, females signalled more often than females tested in the absence of playback. After the first playback, almost two-thirds of females signalled a response within 3s. Additionally, one-third of the females signalled within 1s after cessation of white noise, and significantly more in the time periods following noise termination. These results suggest that intermittent noisy habitat conditions elicit GWSS to exploit temporal gaps in the absence of noise for mating communication. Finally, playback bioassays showed that transmission of an 80 Hz pure frequency tone (with and without the 240 Hz harmonic) to plants completely suppressed male signalling to female signal playback. This suggests that an 80 Hz vibrational signal should be tested in laboratory and field experiments to assess its efficacy in disrupting mating of GWSS. Overall, the results of this study are promising as to the possibility of using signal playback for studying the mating system, ecological constraints, and role of intraspecific vibrational signals in promoting dispersal and/or aggregations of wild GWSS populations. In addition, results showed that GWSS mating communication is vulnerable to playback of vibrational signals, suggesting that future mating disruption methods under field conditions may be implemented upon the use of a species-specific disruptive signals (i.e. 80 Hz based signals) that result in little to no non-target effects.

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