

SUPPORT FOR THE SALIVATION-EGESTION HYPOTHESIS FOR *XYLELLA FASTIDIOSA* INOCULATION: X-RAY STUDIES SUPPORTING THE EXISTENCE OF EGESTION

Elaine Backus¹; Wah Keat Lee²; Jacob Socha²; Elizabeth Lee².

¹USDA Agric. Research Service, San Joaquin Valley Agric. Sci. Ctr. Parlier, CA 93648, USA; elaine.backus@ars.usda.gov

²Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439.

The mechanism of inoculation of the Pierce's disease bacterium, *Xylella fastidiosa* (Xf), by vectors such as the glassy-winged sharpshooter (GWSS) is still unknown, despite nearly 70 years of study. Research in support of the salivation-egestion hypothesis for Xf inoculation is presented. Two important features of this hypothesis are: 1) uptake of saliva into the precibarium, causing attached Xf bacteria therein to loosen from the cuticle, followed by 2) expulsion (egestion) of saliva containing loosened bacteria into the xylem prior to ingestion. To directly observe actions of cibarial muscles controlling ingestion (uptake) and putative egestion of fluid from the precibarium, live, feeding GWSS were X-rayed and video-recorded in the Advanced Photon Source at the Argonne National Laboratory. Simultaneously, feeding of X-rayed sharpshooters also was recorded using AC-DC Electrical Penetration Graph (EPG) technology. Cibarial muscles were observed to be attached to two sets of tracheae inside the head. The tracheae moved at different times during feeding, clearly indicating muscle movement. Video indicated rhythmic pulsing of primarily dorsal tracheae was correlated with EPG waveform C2, whereas abrupt, non-rhythmic, dorsal tracheal movements were correlated with EPG waveform C1. Gentle fluttering of both sets of trachea was correlated with waveform B1. Results indicate that B1 is correlated with uptake of small amounts of fluid, presumably into the precibarium alone for tasting and possibly rinsing egestion of small amounts of fluid. C1 is correlated with rapid release of the cibarial diaphragm, probably powering discharging egestion from the cibarium. C2 is correlated with uptake of large amounts of fluid into the precibarium and cibarium, for ingestion (swallowing). Because the cibarial dilator muscles are the only means by which egestion could be performed, results provide indirect support for egestion.

Financial support: USDA ARS, Argonne National Laboratory