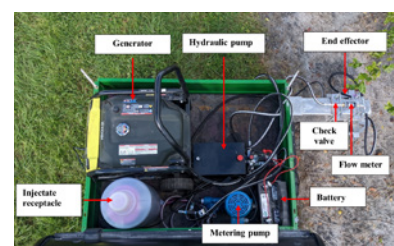
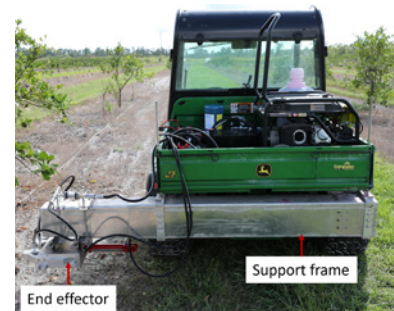
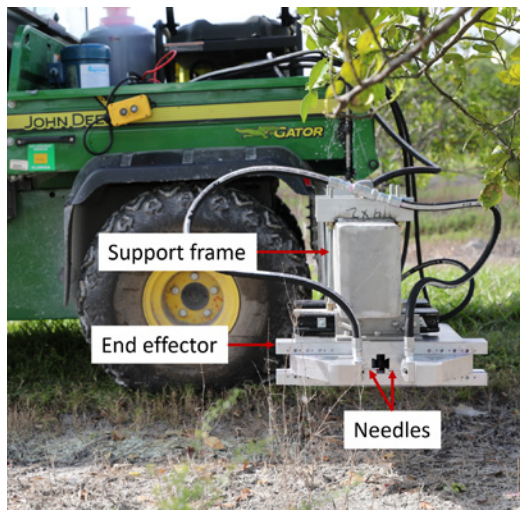


# Delivering Therapeutic Materials through the Trunk to Treat Huanglongbing-affected Citrus Trees

**Researchers:** Ozgur Batuman, Yiannis Ampatzidis, Ute Albrecht, Fernando Alferez, Tara Wade, Nabil Killiny, Amit Levy, Veronica Ancona, Louise Ferguson

**Contact:** Ozgur Batuman, [obatuman@ufl.edu](mailto:obatuman@ufl.edu)

UF/IFAS SWFREC



**Summary:** Current devices for introducing liquid materials such as oxytetracycline (OTC) into citrus trunks are drill-based, relatively large-sized, single injectors combined with pressure, which sometimes cause considerable phytotoxicity and harm the tree. Our project aims to develop an automated delivery system (ADS) consisting of needle-based multiple injectors to reduce injury and effectively deliver therapeutics to citrus vascular tissues through the trunk to improve plant health and performance. The prototype of ADS (see figure) developed at UF/IFAS SWFREC in Immokalee effectively grips and penetrates the trunk of mature citrus trees from two sides and injects up to 250 ml of OTC in

a minute. The most current ADS does not cause noticeable damage, but longer-term effects must be determined. We are now injecting different types of therapeutics, including various bactericides, nanoparticle metals, peptides, nucleic acids, agrochemicals, plant defense inducers, growth regulators, and nutrients, to understand their uptake, movement, and distribution in the plant. We will further modify the current ADS device with AI-enhanced technologies to make it autonomous and reduce or eliminate extensive shear and tear due to its repetitive use on mature trunks to treat hundreds of trees much faster. Later, we will try the ADS in our grower cooperators'

groves throughout Florida's main citrus production regions.

## Take Home Message:

- An automated delivery system (ADS) including needle-based multiple injectors is under development to improve citrus tree health by minimizing phytotoxicity and optimizing therapeutic delivery.
- The current ADS prototype injects up to 250 ml of oxytetracycline per minute into citrus trunks without immediate harm.
- Future developments aim to enhance ADS with AI for autonomous operation, reducing wear during repetitive use on mature citrus trunks to speed up treatment.

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