Geophysical Research Abstracts
Vol. 18, EGU2016-17808-2, 2016
EGU General Assembly 2016

Pathogen filtration to control plant disease outbreak in greenhouse production

Sangho Jeon (1), Charles Krasnow (1), Gemini Bhalsod (1), Leah Granke (1), Blair Harlan (1), Mary Hausbeck (1), Wei Zhang (1,2)

(1) Department of Plant, Soil and Microbial Sciences, Michigan State University, East Lansing, USA, (2) Environmental Science and Policy Program, Michigan State University, East Lansing, USA

Previous research has been extensively focused on understanding the fate and transport of human microbial pathogens in soil and water environments. However, little is known about the transport of plant pathogens, although these pathogens are often found in irrigation waters and could cause severe crop damage and economical loss. Water mold pathogens including Phytophthora spp. and Pythium spp. are infective to a wide range of vegetable and floriculture crops, and they are primarily harbored in soils and disseminated through water flow. It is challenging to control these pathogens because they often quickly develop resistance to many fungicides. Therefore, this multi-scale study aimed to investigate physical removal of plant pathogens from water by filtration, thus reducing the pathogen exposure risks to crops.

In column-scale experiments, we studied controlling factors on the transport and retention of Phytophthora capsici zoospores in saturated columns packed with iron oxide coated-sand and uncoated-sand under varying solution chemistry. Biflagellate zoospores were less retained than encysted zoospores, and lower solution pH and greater iron oxide content increased the retention of encysted zoospores. These results provided insights on environmental dispersal of Phytophthora zoospores in natural soils as well as on developing cost-effective engineered filtration systems for pathogen removal. Using small-scale greenhouse filtration systems, we further investigated the performance of varying filter media (i.e. granular sand, iron oxide coated ceramic porous media, and activated carbon) in mitigating disease outbreaks of Phytophthora and Pythium for greenhouse-grown squash and poinsettia, respectively, in comparison with fungicide treatment. For squash, filtration by iron oxide coated media was more effective in reducing the Phytophthora infection, comparing to sand filtration and fungicide application. For poinsettia, sand filtration performed better in controlling the Pythium infection than fungicide application, and nutrient limitation in crops was observed under filtration by activated carbon. Overall, our results suggests that filtration of irrigation water can be effective in reducing crop disease outbreaks, while decreasing the use of fungicides and thus promoting the crop and environmental health.