Detecting Downy Mildew Spores Before Symptoms Develop

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Downy mildew has become a significant challenge for cucurbit growers, and is particularly severe on cucumber (symptoms shown in picture below). Caused by the water mold *Pseudoperonospora cubensis,* downy mildew spreads rapidly via wind-blown sporangia (spores of the pathogen). Knowing when the pathogen spores are present in your county is critical to disease management. Currently, when an outbreak occurs it is reported to the national cucurbit downy mildew reporting website (http://cdm.ipmpipe.org/) and alerts are sent out to growers in the area. This system has vastly improved our ability to control the disease, but it still relies on an outbreak – some diseased plants. We hope to enhance the system by detecting pathogen spores PRIOR to a disease outbreak.

We have used solar-powered spore traps with two vertical spinning rods that can sample 62 liters of air/minute, to collect wind dispersed spores within an area (see photo below). Rather than staining, counting and differentiating spores based on morphology, we used the spore trap for total DNA extraction and polymerase chain reaction (PCR) assays. Preliminary field trials were conducted in both 2011 and 2012 using spore traps combined with PCR and we were able to detect airborne inoculum before symptoms appeared, but the system is still being perfected.

During the 2012 season, three rotorod spore traps were set up in two fields in Geneva, NY. Each trap was fitted with a Watchdog data logger to monitor air temperature, relative humidity, and due point. Two sample collection rods per trap were lightly greased and perpendicularly attached to each end of a horizontal rod, which was fixed at its center to a motor. Sample rods were collected every two to four days, placed in plastic collection tubes, and stored in a refrigerator pending DNA extraction in the lab. Clean rods were re-mounted on each trap after collection. DNA was extracted from everything that was stuck to the rods, and PCR was performed on extracted DNA.

The pathogen was detected with our spore traps in June, however symptoms were not reported in our area until early August. Our hypothesis is that the hot and dry weather conditions were not conducive to disease development. We will continue field studies with the spore traps next season to improve our sampling and detection methods to ensure accurate detection of *P. cubensis* sporangia. This information, along with environmental data, will be useful in predicting outbreaks of cucurbit downy mildew and timing of initial fungicide applications.