Special Research Report #121: Disease Management

Influence of a surfactant in recirculating systems on plant mortality caused by zoosporic root-infecting pathogens

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BACKGROUND

It is well documented that recycling of a pathogen-infested nutrient solution contributes significantly to the spread of zoosporic pathogens (i.e., *Pythium* and *Phytophthora* species) in soilless and container culture of many greenhouse crops.

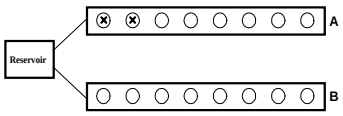
Our specific objectives were to: (1) evaluate the ability of zoospore-producing pathogens to spread from an infected plant to healthy plants located on an individual ebb-and–flow bench and to determine the ability to spread from an infested bench to a non infested bench solely via the recirculating nutrient solution, and (2) to evaluate the efficacy of a surfactant in the control of root diseases caused by zoosporic pathogens in recirculating systems in which plants are cultivated in an organic substrate.

The latter was included because surfactants have previously been shown to be effective in the control of zoosporic pathogens in vegetable crops cultivated hydroponically in an inorganic substrate.

In addition to the ebb-and-flow experiments, we conducted pot experiments in which the recirculating nutrient solution (with and without a surfactant) was delivered to pepper plants for 30 min every 3 hr via an emitter positioned 2 cm above the surface of the potting medium.

MATERIALS AND METHODS

Two pathogen-host systems were used: *Pythium aphanidermatum* versus poinsettia and *Phytophthora capsici* versus pepper. All experiments were conducted in a greenhouse 75-90°F containing 12 two-sided cultivation units.



Cultivation Unit

Each unit was connected to a common 50-liter reservoir and each unit contained 8 plants (16 per unit) in 9-cm-diam. pots containing a commercial potting medium. In the ebb-and-flow studies, each unit was irrigated daily for 1-2 hr (nutrient solution depth was 3.5 cm). After irrigation, the solution was allowed to drain back into the reservoir.

Two plants on side "A" of each unit were inoculated (at the hypocotyl) with a culture of the pathogen. This method of inoculation permitted us to evaluate pathogen spread from a point source.

The primary synthetic surfactant used in control studies was "Naiad Soil Penetrant." In ebb-and-flow studies, the surfactant was added to the reservoir at the following rates: 200 ug a.i./ml 1 wk prior to inoculation and 100 ug a.i./ml at 7-14 day intervals. In the top-irrigated experiments, the surfactant was applied every 3-7 days.

RESULTS

Pythium aphanidermatum and *Phytophthora capsici* spread from inoculated plants to healthy plants located on the inoculated side of ebb-and-flow bench (side "A") and both pathogens then spread from the inoculated bench (side "A") to plants on the noninoculated bench (side "B") solely via the

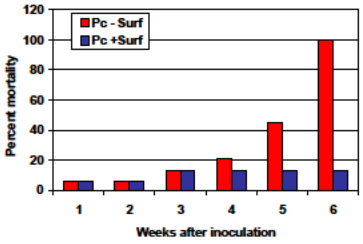
recycled nutrient solution. Without a surfactant in the recirculating nutrient solution, all poinsettia and pepper plants died within 6 weeks following inoculation of the two plants on side "A" of the cultivation unit.

Mortality of poinsettia plants in an inoculated (left) and noninoculated (right) ebb-and-flow units.

Spread of zoosporic pathogens from an infected plant to healthy plants, either on an individual ebb-and-flow bench or between two benches was prevented (100%) by application of a surfactant to the recirculating nutrient solution.

Mortality of pepper plants in a surfactant- amended (right) and nonamended (left) ebb-and-flow units.

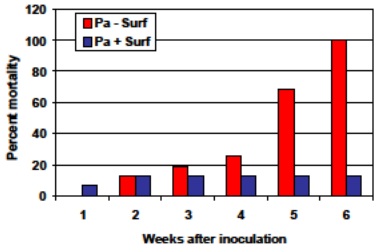
Effect of a surfactant on mortality of pepper plants caused by *Phytophthora capsici*



Mortality of poinsettia plants in the presence of a surfactant in the recirculating nutrient solution.

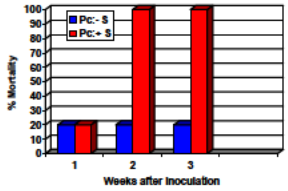
Mortality of poinsettia plants in the absence of a surfactant in the recirculating nutrient solution.

Effect of a surfactant on mortality of poinsettia plants caused by *Pythium aphanidermatum*



In the absence of a surfactant, all pepper plants in the top-irrigated system died within 2 weeks following inoculation of two plants in the unit. Only the inoculated plants died in the surfactant treatment.

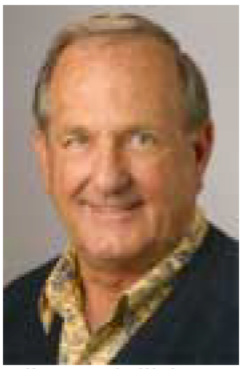
Efficacy of surfactants in the control *Phytophthora capsici* on peppers in a top-irrigated pot cultural system



CONCLUSIONS AND IMPACT TO THE INDUSTRY

Zoosporic pathogens can spread from infected to healthy plants via the recirculating nutrient solution in both ebb-and-flow and top-irrigated systems. However, the ebb-and-flow cultural system appears to be less conducive to pathogen spread with respect to rapidity of plant death. Irrespective of the type of irrigation system, amending the recirculating nutrient solution with a surfactant provided efficacious disease control.

For Additional Information Contact:



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