EDITOR'S EMPHASIS

By Jeff Roseman, CWS,
Aqua Ion Plus+ Technologies

Reclaim Greenhouse Water

Copper Ionization, Ozone Provide Effective Pythium Treatment

Reclaiming water in the greenhouse industry will soon be something the government will be mandating the growers in the industry to do, as more wells are becoming contaminated from nitrates and phosphorus levels are becoming a concern for public health. This will happen not only in the United States but in other countries as well such as Canada where there are many greenhouse operations. Runoff of the water that leaches into the ground reaches ponds, streams, lakes, rivers and other sources of drinking water. This water quality concern needs to be addressed soon so that the public will not be affected and nature can repair what man-made chemicals have done to destroy the earth's surface. Every day, volatile organic compounds (VOCs) enter our water tables. As rainwater and runoff move through the hydrological cycle they acquire VOCs that contaminate our water supply. The water we drink and use for everyday purposes is taken for granted to be clean and free from contaminants, but that is far from the truth.

Steel mills, paper mills and other industries must watch and monitor what goes into the ground. Now, another industry is faced with a dilemma whose solution could be costly and hard to enforce. The greenhouse industry is faced with a problem that is very touchy, to say the least. The growing of crops in the fields always has been monitored and the runoff of pesticides and herbicides has been a controversy for years. DDT and many other very effective chemicals that were tested and deemed to have negative health effects by the U.S. Environmental Protection Agency are not used in the fields or orchards any longer. The problem the greenhouses have is that reclaimed water could contain contaminants and disease and very well could be passed along to the entire crop. One plant could be diseased and then the reclaimed water has the potential to transfer the disease to every plant. Some growers already have experienced this problem as they are trying to find more environmentally friendly ways to water and conserve fertilizer for their operations in addition to remaining friendly to the environment.

NFT closed loop systems have been using UV light to combat this problem, but with high turbidity and scaling of the quartz sleeves it proves to be cumbersome, high maintenance and very risky.

There has been testing and use of hydrogen peroxide to control disease and pathogens with mixed results. Also, the use of ionization has been introduced. Similar to hydrogen peroxide, ionization displayed positive and negative findings.

Aeration is another technology option for reclaiming water. Whether the crop is on flood floors or in trays, the aeration method will not infect the rest of the crop. However, there still remains some risk of crop loss, which makes this method ineffective as well.

Finding a solution that will work and be cost effective is the whole key to making some method work for the industry. On a small scale most of these methods would be something that a grower could implement and use very easily, but with the volumes of water some of these greenhouse operations use, it becomes cost prohibitive. Nonetheless, the industry must find a method that works and complies with government restraints on the dumping of fertilizers into the ground.

The following study was done on a small scale to prove the reduction and elimination of pythium in leachate water. This test was done to show a possible method of using ozone and copper ionization as a means of destroying pythium in contaminated water. The method was quite effective and with further research could be a very effective method of water recovery.

The test was performed and documented on February 21, 2001. Understanding water chemistry and the technologies to treat pathogenic pressure helps this writer find solutions to solve problems for the industry.

Purpose of Study

The purpose of this study is to observe the effectiveness of destroying pythium from a simulated leachate water recovery system and also to see if the disease could be removed from the slab (rockwool) growing medium.

Pythium is a serious fungal root-rot pathogen in greenhouses that is caused primarily by the fungus *pythium aphanidermatum* and is sometimes called "grease spot," "cottony blight" or simply "pythium." This disease complex is found under cool, moist conditions and is associated with seedlings, young plants and turfgrasses, warm and cool season, all of which are susceptible to attack. The disease is most severe during hot, humid conditions and where there is limited air circulation. So, good water management is critical.

Method of Study

Samples were gathered that were known to contain pythium. This was determined by symptoms of the plant and root zone. A sample of roots from the rockwool growing medium was extracted and tested for the disease. Infected slabs were rinsed in untreated water (simulated leachate) to inoculate the water. This water then was tested in the same fashion as the slabs to determine positive contamination of the disease.

The next tests were conducted on the water and the slab, after copper ionization and ozone were introduced to the water as a method for disinfection. The copper levels were set at 1.63 ppm and ozone concentration measured by an oxidation-reduction potential (ORP) meter and was

measured at 731 mV. The temperature of the water was 14° C.

A pythium test kit was used to determine the positive and negative results of the disease in the water and rockwool slabs. Only one test was conducted, but this test can be replicated if necessary.

Results

Test 1. This test revealed positive pythium infection of slab and root zone of the media tested (rockwool).

Test 2. This test also indicated a positive pythium infection in the simulated leachate. The ORP of this solution was tested at 212 mV.

Test 3. After 10 minutes of contact in the leachate recovery system, the ORP was measured to be 750 mV and the copper level was determined to be 1.15 ppm. The presence of pythium was tested in the water and found to be negative.

Test 4. The same slab, which tested positive for pythium, was tested after soaking 10 minutes in the leachate recovery system. The pythium test indicated a negative result.

Pythium Can Be Treated

We can conclude that the effectiveness of copper ionization and ozone sterilization on a leachate recovery system is an effective method of treatment for pythium. With ozone as the oxidant and ionization providing a method of disinfection to reduce the pathogen pressure, it stands to reason that this method could provide an effective alternative to other chemicals in eliminating or controlling most organic pathogens in the leachate water. However, this test, being simple, can be replicated and a system on a large scale could be implemented to provide the needed water recovery system a greenhouse operation would need.

About the Author
Jeff Roseman is a CWS-I with the Water Quality Association. He is the owner of Aqua Ion Plus+ Technologies and has designed and developed ionization and ozone systems for use in the greenhouse and agriculture industries. With a background in chemistry and physics from studies at Purdue University in electrical engineering, he is poised and ready to help the industry find methods to control pathogens and disease. For more information he can be reached at jeff@aquaionplus.com. More information is available at www.aquaionplus.com.

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