A Publication of the UMass Extension Greenhouse Crops & Floriculture Program

# Floral Notes Newsletter

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## In This Issue



## USDA/APHIS Proposes Changes in Chrysanthemum White Rust Regulations

Chrysanthemum White Rust (CWR) has been an issue for growers for the last few years. The weather conditions in the Northeast and Western Regions of the United States in certain years can be ideal for the development of CWR on the hardy mum crop. Many Massachusetts hardy mum growers have had to make management decisions concerning CWR and these decisions have had a dramatic impact on the cost of production.

In the fall of 2009 the Massachusetts Flower Growers' Association and the Connecticut Greenhouse Growers' Association proposed changes in CWR regulations to top administrators in USDA/APHIS. The process has moved slowly but has now progressed to where a meeting is tentatively scheduled for early winter 2012 to have growers discuss and review a proposal to change CWR regulations to a Regulated Non-Quarantine Pest or (RNQP). This change would allow growers to deal with CWR as a common disease pest. CWR regulations would continue to stay in place for propagators and imported plant material would still be subject to inspection at the US borders.

Growers, industry representatives, federal and state regulators and researchers will attend the meeting. The purpose of the meeting is to provide an opportunity for stakeholders to discuss their thoughts and propose options on how best to safeguard the United States industry from Chrysanthemum White Rust (CWR).

The Massachusetts Flower Growers' Association will be represented at the meeting. If you have any questions or have comments on the matter please feel free to contact the MFGA office.

### UMass on YouTube

Three new videos are available! "How to Take a Soil Sample", "One to Two Dilution Method for Soil Testing" and "Pour Thru Method for Soil Testing" Link to the UMass Floriculture YouTube channel: http://extension.umass.edu/floriculture/

Also, take a brief tour of the new UMass greenhouse by Googling "UMass Cultivates New Greenhouse" or go to YouTube and search same.

# *Employee Training for Garden Retailers*

**March 29, 2012, 9:00 AM – 3:00 PM**

**Publick House, Route 131, Sturbridge, MA**

*For garden center employees, horticulture retailers, roadside stands, master gardeners and others…*

**8:30-9:00** **Registration, Coffee and Muffins**

**Morning Session: 3 pesticide contact hours for categories 26, 29, 31, 36 and applicator licenses.**

**9:00-9:50** **Late Blight & Garden Tomatoes, Downy Mildew & Garden Impatiens and How Fungicides Work** Rob Wick, UMass Plant, Soil & Insect Sciences

Late blight is a devastating disease for home gardeners and commercial farmers. Down mildew was diagnosed on garden impatiens in the landscape in MA for the first time in 2011. Learn about these important diseases and what to look for. Rob will also explain how fungicides work.

**9:50-10:45** **Exotic Pests, New Strategies Update** Jennifer Forman-Orth, State Plant Pest Survey Specialist, MDAR

What's the current information about Asian Longhorn beetle, Brown Marmorated stinkbug, Boxwood Blight and more? How do these and other invasive species get here to become a problem, and what regulations are in place to stop them? This session will include updates on survey work, eradication efforts, research and treatments.

**10:45-11:00** **Break**

**11:00-12:00** **How to Manage the Dirty Dozen Most Common and Difficult Weeds** Randy Prostak, UMass Extension

You get the questions…How do I control poison ivy or crab grass or Japanese knotweed or bittersweet? Randy will help provide answers using a variety of weed control strategies and retail products.

**12:00-1:00** **Lunch** Bring your own, fast food restaurants, or best option, have lunch at the Publick House restaurant.

**1:00-2:00** **How to Plant a Fruiting Wall Jon Clements, UMass Extension**

Your customers would love a fruiting wall (two bushels each of five apple varieties in just 3 years from planting using just over 100 square feet of backyard!). Jon will take you step-by-step on what customers would need to know.

**2:00-3:00** **Culinary Herb Favorites and How to Play them Up with Customers!** Jodie Gilson, J. Gilson Greenhouses, Groton, MA

Jodie has many years of experience growing herbs as a wholesale and will share her tips and misconceptions for growing and marketing her most popular culinary herbs.

**For more info, contact Tina Smith, UMass Extension at 413-545-5306, tsmith@umext.umass.edu**

**Pre- register by March 26, 2012**

**Cost is $45 per person or** $40 per person for three or more registrations from the same company. Morning coffee and muffins and handouts included in registration. **Make checks payable to UMass and send to:** Garden Retailer Training, UMass Extension, Rm. 203 French Hall, 230 Stockbridge Rd., Amherst, MA 01003. **On-line registration link from** http://extension.umass.edu/floriculture/

# *Water Quality: What's In Your Water?*

Paul Fisher, Dustin Meador, Jennifer Parke, Robert Wick and William Argo

**This article was originally published in Greenhouse Management, October 14, 2011.** Paul Fisher is Associate Professor and Extension Specialist, Dustin Meador is Graduate Student, Environmental Horticulture Department, University of Florida, pfisher@ufl.edu. Robert Wick is Professor of Plant Pathology, Department of Plant, Soil and Insect Sciences, rwick@pltpath.umass.edu. Jennifer Parke is Associate Professor, Department of Crop and Soil Science, Oregon State University, jennifer.parke@oregonstate.edu. William Argo is Technical Manager, Blackmore Co., bargo@blackmoreco.com.

If you are recirculating irrigation water or drawing water from a pond, testing the biological water quality can be important. What might you test for? In addition to waterborne pathogens, microbial water issues result in algae on the growing substrate and floors, and clogged equipment from bacteria and biofilm. For growers producing edible crops, human pathogens, including strains of *E. coli*, are regulated.

**Working with a testing lab**

Most tests of biological water quality require samples to be analyzed by professional laboratory services, which are provided by water treatment companies, university extension plant pathology labs and private microbiology labs. Onsite detection methods for biological water quality are being developed, but tend to be useful as indicators rather than specific diagnostic tools.

For laboratory tests, contact the lab before you submit samples. Things you should discuss with the lab include:

- What to test for. The lab needs to understand whether you are interested in testing for a particular pathogen species or a class of organisms (such as aerobic bacteria) so it is ready to run the appropriate test when the samples arrive.
- How to collect samples. The samples should be representative of the irrigation water. Take the samples after the irrigation water has run for 5 minutes or long enough to ensure that you are not sampling water that has been sitting in the piping. For ponds, the usual procedure is to sample from the intake pipe depth.
- The sample volume and containers. Some laboratories provide sterile sampling containers. Typically 350 milliliters is enough. If sterile containers are not available, then purchase distilled water containers from a grocery store, empty the container and flush several times with the sample.
- Proper labeling and documenting samples including lab forms.
- Storing samples and packaging (usually in insulated containers with a cool pack).
- When to ship samples (usually early in the week with overnight shipping).

**Testing for pathogens**

Plant pathology laboratories use either baiting (attracting pathogen spores to a leaf) or filtration to concentrate pathogens in the water sample. The sample is then plated out on agar substrates that selectively grow different classes of organisms, to identify the presence or absence of pathogens and the number of colonies. This type of test for pathogens is typically to the genus level, with tests for *Pythium* and *Phytophthor*a being the most widely available. For example, the University of Massachusetts provides this service for $50 per sample, with a one to two week turnaround to allow time to culture the sample (Table 1).

Pathogen testing could be used to determine if a water treatment technology is controlling *Pythium*. To test treatment efficacy, water samples could be collected from sources before and after the point of water treatment (with activated peroxygens, chlorine, chlorine dioxide, copper, ozone, UV radiation or another technology) and tested for living colonies of *Pythium*. Biological water quality changes very quickly. Therefore, repeat testing over the growing season is an advised monitoring strategy if waterborne pathogens are suspected.

Identification of pathogens to the species level requires a specialist, but many species of *Pythium* and *Phytophthora* can be identified by conventional or molecular techniques. Identification to species level is most important when there is there is a specific pathogen suspected, such as *Phytophthora ramorum*.

The presence of *Pythium* does not necessarily mean there will be root disease but *Phytophthora* is more aggressive and should always be considered a problem. Nevertheless, if a lab reports the presence of *Pythium* or *Phytophthora* at the genus level, it is prudent to assume that a pathogen is present and to treat the water and crops accordingly. Follow up with additional water tests after crop management treatments are carried out.

The University of Guelph can identify the pathogen species based on characteristics of their DNA (Table 1). This test can evaluate a number of species in a single analysis. However, the test will not differentiate between live and dead microbes.

Whether pathogens are viable is important if you are treating water with a sanitizing agent technology and want to know whether the pathogens are killed by the treatment. In this case, culture-plating may be more useful than DNA analysis.

**Diagnostic kits**

Researchers are developing protocols to use ELISA diagnostic kits as a preliminary screening test for waterborne pathogens. Field diagnostic kits are available for *Pythium* and *Phytophthora*. The kits use monoclonal or polyclonal antibodies to detect the pathogens. This is the same technology used in home pregnancy test kits. Kits are available as dipsticks or as lateral flow devices (see Table 1 for suppliers).

Many growers already use these ELISA kits to identify pathogens on leaves, with instant results. Trialing at Oregon State University has found that some ELISA tests for *Phytophthora* cross-react with a few *Pythium* species, so that if the test is positive, it is important to follow up with laboratory tests. Lab testing is also advised to rule out the presence of *Phytophthora ramorum* from water that has tested positive in a *Phytophthora* test kit. Test kits detect both live and dead forms of these pathogens.

**Total microbial load**

Total colony count expressed as colony forming units (CFUs) of either bacteria or fungus is a non-specific measurement, meaning these tests estimate the amount of large groups of diverse organisms. Total CFUs of bacteria or fungi are not a good indicator of plant pathogens, because most microorganisms in water samples are likely to be beneficial or benign, rather than pathogenic.

The goal of treating irrigation water is not to eliminate bacteria or fungus, but to keep the CFUs managed so that they don't degrade water quality or limit control of pathogenic organisms. Greenhouses are not sterile environments, and attempting to completely sterilize water, all surfaces and the growing substrate would require high doses of chemicals that are likely to be phytotoxic to crops. Removing beneficial organisms can also increase the likelihood that pathogenic organisms will cause disease. Clogging of irrigation equipment is, however, a common problem resulting from high microbial density in water.

**Table 1.** A summary of available biological tests for water.

| Biological measurement | Analysis | Significance | Cost | Example sources | Units and target range |
|---|---|---|---|---|---|
| Culture plating of plant pathogens | Laboratory | Identifies living pathogens, usually to the genus level. | \$50-\$100 | Various laboratories. For example, *Pythium* and *Phytophthora* at University of Massachusetts, (413)-545-3209; http://extension.umass.edu/agriculture/index.php/services/plant-problem diagnostics<br>University of Florida Extension Plant Disease Clinic, http://plantpath.ifas.ufl.edu/pdc | Lab-specific. May be presence/ absence or quantitative. Some plant pathogens are quarantine issues or under regulatory control. |
| Pathogen DNA analysis | Laboratory | DNA scan. Highly specific, but won't differentiate between live and dead organisms | \$125-\$195 | Various labs. University of Guelph Laboratory Services (519) 767-6227; www.guelphlabservices.com | Presence, absence or semi-quantitative |
| ELISA-based test kits for *Pythium* and *Phytophthora* | Onsite | Not species-specific.<br>Some cross-reactivity between *Phytophthora* species and *Pythium* species. Does not differentiate between live and dead organisms. | \$7-\$13 per test | Various suppliers. For example, Immunostrip at www.agdia.com.<br>ALERT-LF at http://plant.neogeneurope.com.<br>Pocket Diagnostic at www.pocketdiagnostic.com. | Presence or absence. |
| Total density of bacteria and fungi | Laboratory<br>Onsite: Protocols being developed to use 3M Petrifilms for heterotrophic bacteria and yeasts and molds. | Indicator of biological load. May be useful to test biofilm risk, and pre- and posttreatment. Majority of micro-organisms likely to be benign or beneficial. | 3M Petrifilms \$1-\$2 per sample in packs of 25 and up. | Microbiology laboratories<br>3M Petrifilms: Find online (e.g. www.sciencekit.com) or contact 3M, (800) 515-8114. | More than 10,000 heterotrophic bacteria colony forming units/ml is recommended to avoid clogging of emitters. |
| Algae | Laboratory (preferred)<br>Onsite: Lamotte Algae kit AWL #6662. | Clogging, wetting of growing substrate, aesthetic, safety, shoreflies. | Lamotte kit, about \$140 | Water testing labs specializing in algae. For example, www.greenwaterlab.com<br>Test kit: www.lamotte.com | Lab-specific. Chlorophyll, or identification and quantification. |
| Human pathogens (culturing or nucleic acid analysis) | Laboratory (preferred)<br>Onsite: 3M Petrifilm exist for some human pathogens (use as an indicator, not regulatory). | Contamination of water with fecal wastes or other sources of pathogens is health risk with edible crops and drinking water supplies. | | Microbiology labs and public health department labs. | Check state health regulations for different water uses. |

Total colony counts within irrigation systems indicate the biological productivity of the water. If water treatment technology has been installed, you want to know whether waterborne pathogens are likely to be controlled if they arise in the source water. You can test the active ingredient dose of the sanitizing agent compared with published recommendations, and analyze indicator organisms such as total bacteria and fungus CFUs from samples both before and after the point of treatment in the irrigation line. The change in microbial density before and after treatment may be a useful bio-indicator of the general efficacy (or failure) of the treatment system to control microorganisms.

Sampling at points along an irrigation system can also identify where conditions favor growth of microorganisms. Excessive organic matter increases the number of microorganisms and the risk of clogging equipment. Changes in CFUs from the source water to the emitters can also help monitor the growth of microbes within the irrigation lines.

There is currently little standardization across private horticulture laboratories on how samples are processed for total density of bacteria and fungus. A threshold of 10,000 colony forming units (cfu) of aerobic bacteria per milliliter is generally recommended to reduce clogging of drip lines and micro-emitters.

One technology used at the University of Florida to measure total density of bacteria and fungus is 3M Petrifilms (www.3m.com). Petrifilms are plastic cards coated in a dehydrated nutrient film with microbial indicators. A droplet of water placed on the Petrifilm can be stored for three to five days in the dark at room temperature, and each colony forming units makes a colored dot on the Petrifilm to allow counting. Different types of Petrifilm are available for aerobic bacteria, yeasts and molds (i.e., fungus and fungal-like organisms), or other pathogens of importance to human health. University of Florida researchers have trained growers with the Petrifilms, who have found the method easy to use.

**Algae testing**

In horticulture, algae are often thought of as the "green stuff" that workers slip on, causes blooms in ponds and coats the growing substrate, benches, floors and irrigation lines. In reality, algae are a complex of many unrelated species and groups (cyanobacteria, green and red algae) that range from unicellular bacteria-like organisms to complex aquatic plants.

The horticulture industry will probably need to become more educated about algal biology as control methods are evaluated. For example, pond chemicals vary in control of different types of algae (www.extension.purdue.edu/extmedia/HO/HO-247-W.pdf).

Samples can be sent to a testing laboratory for identification and quantification of algae and other aquatic weeds, which is most likely to benefit growers drawing water from catchment basins with algal bloom issues.

Growers can quantify algal concentration by sending a sample to a specialist laboratory that will measure total chlorophyll. A grower-friendly kit is available for extracting algae (Table 1) which involves filtration to concentrate the algae on a disc, and extraction of the chlorophyll. However, this testing method is qualitative. The color of the filter disc or extracted solution can be viewed and determined if it is "clear", "green" or "very green". In a laboratory setting, a spectrophotometer is used to quantify chlorophyll concentration in the water sample. Standards have not been defined for "acceptable" or "problem" levels for algae in greenhouse applications, although researchers at the University of Florida are starting to accumulate some data.

**Human pathogen testing**

Levels of human pathogens are regulated when using water for drinking supplies, irrigating edible fruits (especially with methods that wet foliage or fruit), and for post-harvest washing of produce. Some states have regulations for coliform levels in water used to irrigate non-food crops.

Outbreaks of human disease caused by contaminated produce emphasize that monitoring to ensure irrigation and wash water are free of human pathogens is a critical food safety issue. More information is available on water testing for human pathogens at http://edis.ifas.ufl.edu/ss482.

**Why you should test**

Tests for biological quality can help avoid crop losses from diseases, unsightly algae, clogging of equipment, and health issues from contaminated produce. Most organisms in water are too small to see with the human eye. Consider monitoring to catch biological water problems before they cost you money.

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*Greenhouse Management*

# *Protect Your Water System with a Good Filter*

John W. Bartok, Jr.
Agricultural Engineer
135 Pumpkin Hill Rd.
Ashford, CT 02768

Suspended solids need to be removed to prevent clogging of piping, valves, nozzles and emitters in an irrigation system. This becomes more important the smaller the nozzle or emitter opening.

Suspended solids may come from many sources. Surface and recirculated water may contain sand, soil, leaves, organic matter, algae and weeds. Ground water, although usually clean, may contain fine particles of sand. All to these can be removed through filtration.

**Filter selection**

Before selecting a filter, a water analysis should be done. The type and quantity of solids should be determined. Keep in mind that seasonal changes such as algae growth or spring runoff can change the loading. Chemicals and minerals in the water can also cause plugging. These may have to be addressed with chemical treatment methods.

The flow rate needed to supply the irrigation system should be determined, taking into account the maximum water usage. This usually occurs during the summer and may amount to 0.3 to 0.4 gallons/sq ft of growing area/day. Also consider the needs of any proposed expansion. Filters are available from 10 to over 1000 gpm capacity. The level of filtration should be determined (Table 1). If you need water for an impact sprinkler system a screen filter having a 30 mesh may be adequate to remove leaves and trash. On the other hand, if the system you are supplying is a microirigation system, a 200 mesh disk filter may be required.

**Table 1.** Minimum filter opening to remove suspended solids.

| Material | Mesh | Inches |
|---|---|---|
| Leaves and twigs | 30 | 0.023 |
| Gravel | 10 | 0.075 |
| Coarse sand | 70 | 0.008 |
| Fine sand | 600 | 0.001 |
| Algae | 2000 | 0.0002 |
| Silt | 3000 | 0.0001 |

A human hair is 150 mesh or 0.004”

The pressure loss created by the filter should be a minimum. Pressure loss is related to the size of the filter opening and the water flow. Use the next size larger filter if the loss is excessive.

**Screen filters**

These come in all sizes and shapes. Intake screens may be placed on the suction end of the pipe supplying water from a pond or stream to remove leaves or algae. Self-cleaning intake screens are available that have high pressure nozzles that clean the screen surface as it rotates.

In-line screen filters can be used as a final filtration if the water is fairly clean. They are low cost and available for a wide range of flows. The water passes through one or two cylindrical screen elements. Suspended particles are deposited on the outside. The most common models are manually disassembled to be cleaned. There are also models that are cleaned by turning a set of brushes that wipe the screen. Automatic hydraulic flushing of debris from the screen is available on some models. Determining when to clean the screen can be done by observing the difference in pressure between the inlet and outlet.

**Disk filters**

The filtering element of a disk filter is made of a large number of flat, grooved rings that are stacked tightly together. The degree of filtration is determined by the number and size ofthe grooves. Intake water surrounds the filter element and is forced through the grooves trapping the particles.

Cleaning is accomplished by reversing water flow. This expands the disk stack and a high pressure water-air spray spins the disks throwing off the trash. This is dumped to a drain.

Disk filters are best suited for water sources with low solids concentration. They have a low head loss and use only a small amount of water to backflush.

Units containing several filters can be assembled with controls so that backflushing of one filter can take place without affecting water flow. These units are now popular for greenhouse operations.

**Media Filters**

Media filters are best for removing organic matter, such as algae and slime and fme inorganic material, such as silt and clay. The filter is a steel or plastic tank containing sand, quartz or other inert material sized to provide the level of filtration desired. Incoming contaminated water flows through the bed depositing the solids. When the pressure loss reaches a predetermined level backflushing begins. Clean water is forced up from the bottom causing a turbulent expansion of the media. Entrapped contaminates are loosened and flow through a separate drain valve.

**Centrifugal separators**

These filters are good for removing sand or other heavy matter from well water. They operate by introducing inlet water in a spinning motion inside a steel cone. Heavier particles as small as 200 mesh are forced by centrifugal action to the outside and slide down to a collection chamber at the bottom. Centrifugal separators are low cost, create very little pressure loss and have high efficiency. They have no moving parts and can be arranged in parallel to increase capacity.

Good, clean water is important to efficient operation of irrigation systems. The wide range of sizes and types of filtration equipment available today fits all the needs of the greenhouse industry.

***Contact UMass Floriculture Extension Staff***

Douglas Cox Floral Notes Editor dcox@pssci.umass.edu
Tina Smith Outreach Educator tsmith@umext.umass.edu